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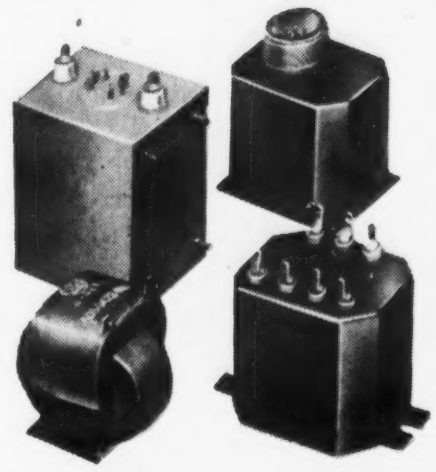

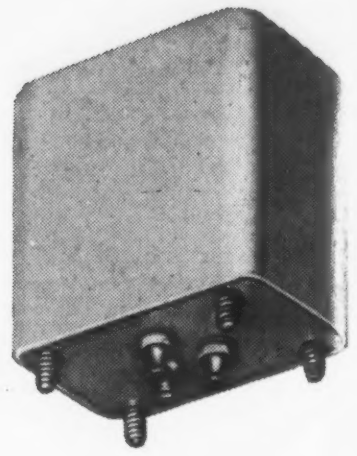

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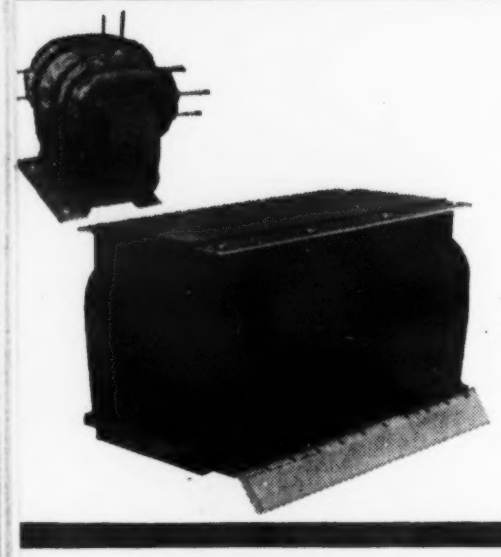

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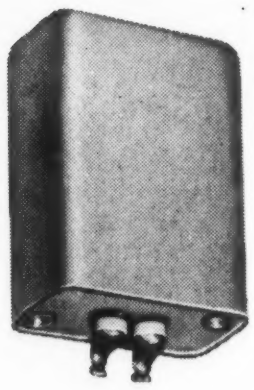

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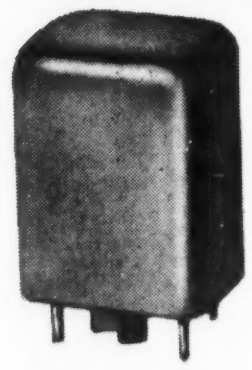

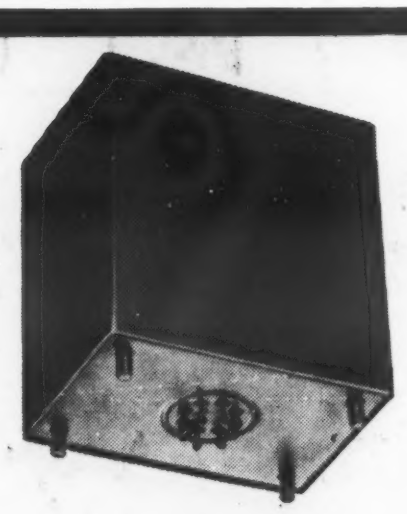

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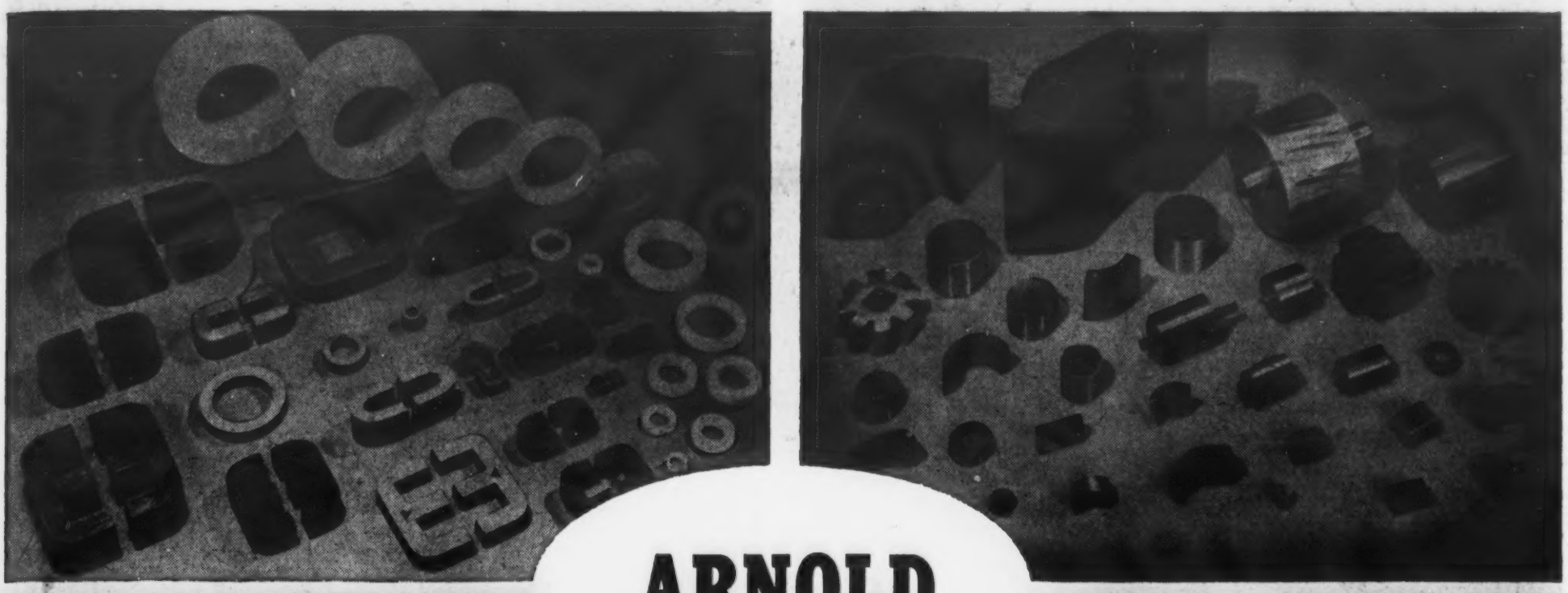

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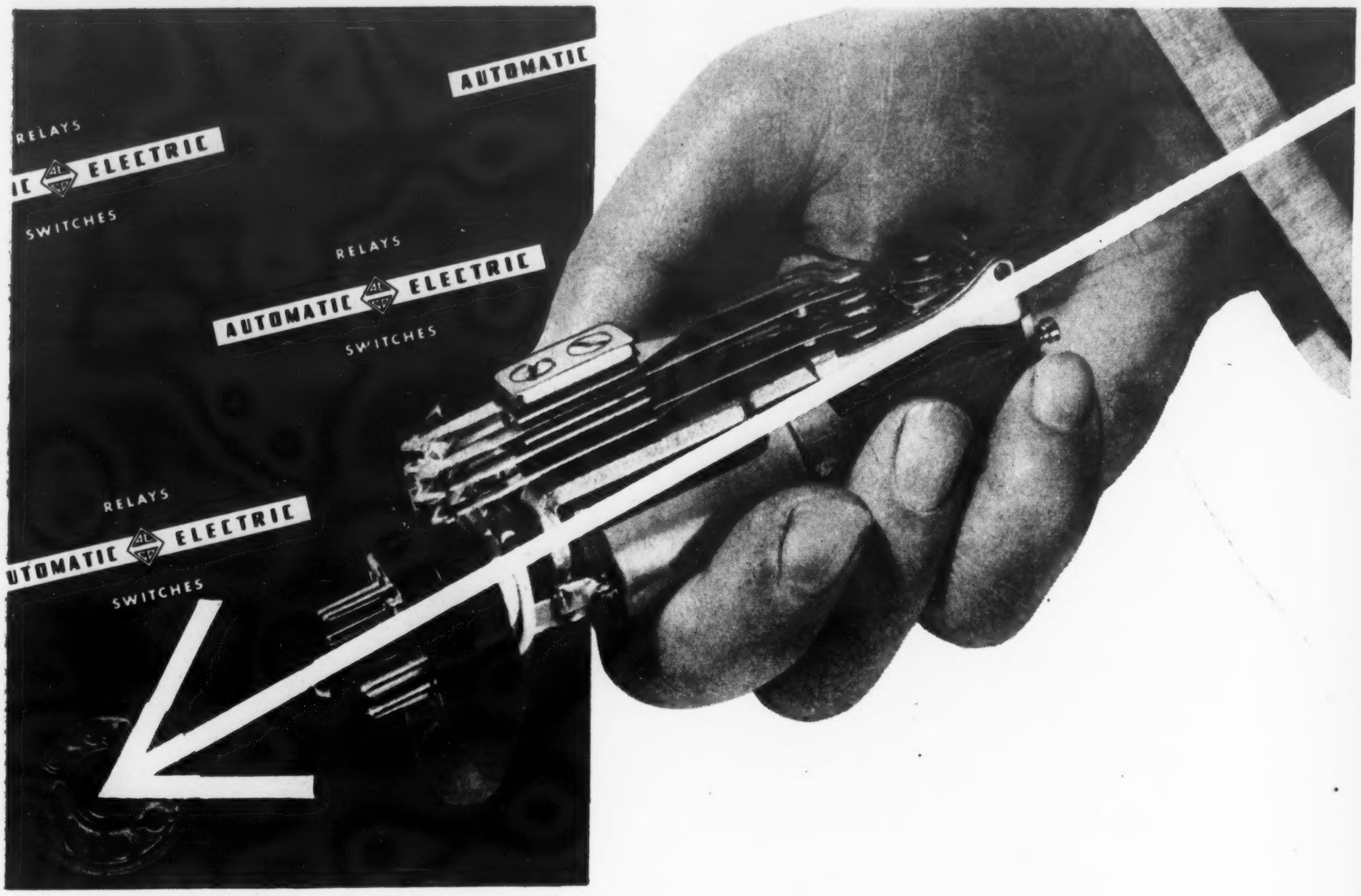

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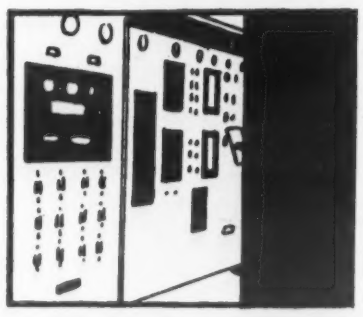

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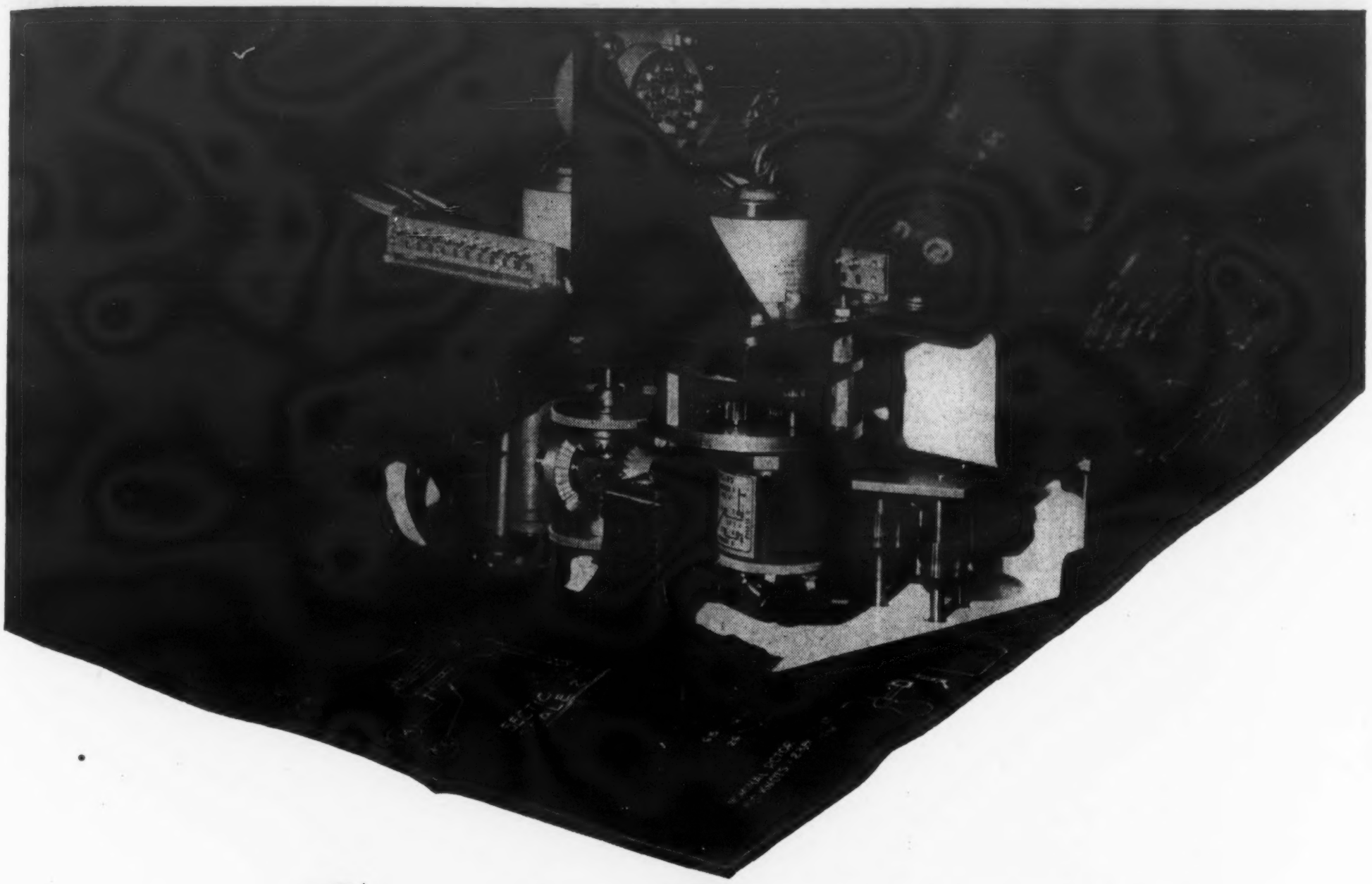

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The Hoover Commission studies Government Procurement

by F. R. Lack
Western Electric Company

A member of the Task Force on Procurement discusses the work of the Commission and lists the recommendations of the Electronics Industry in connection with government buying.

IT HAS BEEN SUGGESTED THAT AFCEA MEMBERS AND READERS of SIGNAL would have an interest in learning of the efforts now being made by the Hoover Commission to study Government procurement operations. With this in mind, the following report is presented, based on my experience as a member of the Advisory Committee to the Hoover Commission Task Force on Procurement.

In order to put this subject of Government procurement into the proper perspective, it would seem helpful to sketch the high points of change in the character and processes of Government procurement since the beginning of World War II.

Prior to 1939, Government procurement dollars were scarce and their spending did not constitute a major factor in the industrial economy. The procurement process was a traditional one that had been used for many years in the spending of public money whether by federal, state, or municipal governments and was essentially the "auction" concept wherein interested producers or suppliers submitted competitive bids on specific proposals. The Government then evaluated them and more or less automatically accepted the lowest one. The contracting officer was personally responsible and might have to reimburse the Government out of his own pocket if he failed to follow the rules or be criticized if he made an error in judgment. He, therefore, carefully restrained any impulse to use his imagination or ingenuity in doing his buying and kept strictly to the book. The whole operation was surrounded by a certain kind of ritual and formality with rigid rules, many of which were at variance with good industrial purchasing practice. Only those contractors who were willing to operate under the rules had an opportunity of getting business. Industry, in general, would have no part of it and the Government suffered thereby.

That this process might have been inordinately costly was not readily apparent since the amounts involved were small in the national economic picture, and not capable of evaluation by Industry and the Public. Moreover, the generally accepted belief that the competitive-bid system with formal advertising unquestionably insured the lowest price served as a deterrent to any investigation as to the true state of the affairs.

The impact of the huge program launched to maintain our World War II effort changed this picture. The fact that nearly 50% of our national output had to be channeled to Government meant that most of Industry was involved. The pedestrian methods which barely sufficed in the earlier period had to be revamped radically to permit greater speed and economy as well as to recognize the limited experience and talent that was available in the Government and Industry for the staffing of procurement operations.

During this period the pattern of procedures for procurement was derived from the carte blanche given the President by Congress under the War Powers Act. The essence of this was to permit procurement by negotiation without waiting for competitive bids. The methods and rules for doing the job developed rapidly during the war years, but the training of people in Government and Industry in the technique of negotiating and writing a contract and the administration of it under its terms was

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The opinions and interpretations expressed herein are those of the author and are not to be construed as official or revealing the views of the Hoover Commission, the AFCEA or the Western Electric Company.

tremendous. Although in the early days paper work frequently followed delivery, before the end of 1943 the system was working quite well considering the circumstances. It was a characteristic bit of American team work in which, when the chips were down, Government and Industry cooperated to do what was necessary.

With the experience gained through World War II and the absence of any major scandals such as characterized World War I procurement, Congress, recognizing the necessity of continuing the techniques learned during the war period and working with the Executive Branch of the Government and Industry, passed the "Armed Services Procurement Act of 1947" in which the advertising and negotiation procedures were given their respective areas of application under appropriate conditions. The Act was a milestone in the develoment of Government procurement technique, and was followed (in 1949) by a similar statute applicable to the non-military procurement activities of the Government.

With the Korean crisis and the continuing cold war, Government procurement now appears to be fixed at a high level requiring 20 to 25% of the national output. This program requires the cooperation of all of Industry and the continued development and improvement in policies and procedures. If we are to get "More Bang for the Buck," the efficiency of the procurement operation and the over-all cost of Government purchases becomes a matter which should interest all of us.

There has been a slow but continuous improvement in procurement procedures since the passage of the Act in 1948. It is only natural to expect that the growing volume of experience with the Armed Services Procurement Regulation (the famous ASPR), which implements the Act, and the supplementing Military Departmental Procedures (Army, APP; Navy, NPD; Air Force, AFPP) will gradually reflect lessons learned with time. Some of the changes introduced have been for the purpose of plugging loopholes, and some for the purpose of simplifying or overcoming onerous requirements and processes.

Mature Process Evolved

It is a continuing effort to achieve a proper balance between the adequate safeguarding of the spending of the public money and at the same time relieving the procurement people of as much of the dead hand of red tape as is possible. To this program of change and improvement there has been contributed the thinking of many individual contractors, particularly of those who maintain large specialized staffs of attorneys, procedural specialists, and management experts. Occasionally, the simplifications recommended by a single contractor have been incorporated for general application when it has been apparent that over-all benefits would result both to the Government and Industry.

The largest contribution has undoubtedly been through the industry associations who have established and maintained for some years committees of their members' specialists in the whole area of procurement and supply operations, and who have jointly studied the difficulties and problems arising from the adoption of new regulations and procedures. These association committees, such as those of the National Association of Manufacturers, the National Security Industrial Association and the Machinery and Allied Products Institute, have attempted to survey the impact of each Government regulation or requirement, assembled a consolidated picture of its effect, and advised the issuing Government organization of the problems stemming from its adoption. This process gradually matured into one where the Government agencies frequently sought preliminary advice and comment in order to find the most promising solutions to certain problems.

In the postwar years, many studies have been made by special advisory committees to various agencies of the Executive Branch such as the Cooper Committee. Each of these committee reports has contributed a better appreciation of some phase of the problem, the need for growth and development of specific functions, and the need for the further transfer of each of Industry's experience and skill to Government operations.

At the same time, Congress has unwittingly been adding to the complexity of the procurement procedure by insisting that the participation of small business, the use of economically distressed areas, and other matters of similar nature be considered in the distribution of Government contracts. The procurement officer trying to carry out a simple purchase task may have to have his recommendation reviewed by number of groups or committees in the procurement center to be sure that it meets all the requirements of the regulations and laws.

Need for Competent Review

In spite of the progress since 1948, much still remains to be done. Both Congress, through its granting of authority, and the Executive Branch, through its operations thereunder, are jointly responsible for what is now the biggest buying job in the Country, absorbing a substantial portion of the Nation's tax dollar and output. If this buying operation is to be carried on under the most effective and efficient methods, there is clearly the need for a competent review by an authority representing *both* these bodies for such an authority should be in a position to make its recommendations stick.

This review was made possible when the 83rd Congress in its first session passed Public Law 108 which created the second Hoover Commission, made up of members appointed by both the Congress and the Executive Branch of the Government, officially known as the Commission on Organization of the Executive Branch of the Government. The declaration of policy embraces the objective "to promote economy, efficiency, and improved service in the transaction of the public business." The Commission organized about a dozen task forces, each assigned to a specific area which appeared to have the greatest room for improvement. One of these was the Task Force on Procurement which has as its scope the entire field of Government procurement — military, civilian, and atomic energy. The first area to which the Task Force addressed itself was Department of Defense procurement.

This Task Force headed by R. W. Wolcott, Chairman of the Board of Lukens Steel Company, included among its members two leaders from the Electronics Industry— Frank M. Folsom, President of RCA, and Mervin J. Kelly, President of Bell Telephone Laboratories. Two other people associated with the Electronics Industry, namely, Vincent deP. Goubeau, Vice President of RCA, and myself were appointed members of the Advisory Committee to this Task Force.

The Task Force received a briefing from Department of Defense officials who explained the functions and policies, and pointed out some of the problems which stemmed from the magnitude and special character of their tasks. The combined Task Force and Advisory Committee personnel were then divided into subcommittees for the purpose of concentrating on specific phases of this broad field. One group of subcommittees was assigned to projects in the area of converting overall strategic and logistic requirements into terms of purchase

requirements; and another group of subcommittees was assigned tasks in the areas of contracting, disposition and inventory control, and studies of coordinated procurement. This second series, known as Subgroup B, had one project on contracting and contracting policies, and another project on the administration of contracts. It is on the latter that I have been working with C. J. Stilwell, President of Warner & Swasey, and a member of the Task Force.

Inquiry Program Launched

The plan of our project subcommittee contemplated obtaining the views of all interested and experienced parties involved in such operations, with particular emphasis upon the criticism and recommendations which could be offered; and with a view toward digesting them and evolving a series of recommendations to offer to the Task Force and the Commission. It was considered important to obtain the views of representative contractors, of the interested and active industry associations, and of the Government procurement personnel at policy, administrative, and operating levels. The scope of the inquiry was originally intended to be limited to contract administration, but it shortly became apparent that contracting policy and contracting procedure would logically have to be integrated in order to obtain a full and comprehensive view.

In order to get the contractor viewpoint, a request was made of the Renegotiation Board to furnish a representative cross-section sample of seven hundred of the four thousand contractors who had contracts subject to statutory renegotiation. In order to insure obtaining all sizes of concerns with the likelihood of reflecting different kinds of attitudes and thinking, the following assortment was requested:

300 contractors doing more than $1,000,000 Government business
200 contractors doing between $500,000 and $1,000,000
100 contractors doing between $250,000 and $500,000
100 contractors doing less than $250,000

When the program of inquiring for their views was launched, a number of other companies requested an opportunity to participate and such opportunities were extended. Also, a number of personal interviews with industry executives were held to insure over-all orientation.

In addition to the foregoing direct contact with contractors, it was recognized that the industry associations would have a great deal of experience and background to contribute to such a study because of the extensive work done by their special Government business advisory committees and groups. A list of fifteen such associations was prepared and an opportunity offered to them to study the subject matter and to submit their views and recommendations.

The preparation of a suitable questionnaire or inquiry form was in itself a considerable task, since practically every significant aspect of contracting policy and the field of contract administration was included. Views were solicited with respect to personnel, organization, and procedures for doing the job itself; to the basic philosophy and policies that underlie all procurement; to the various attitudes on financial aspects of Government business, including pricing and profit concepts; and, in general, to every phase of the subject which usually arises when Government business is discussed. The topics ran the gamut from financing the patents and cut across all the subjects in a way which would involve accounting, legal, engineering, and management interests. Broadly speaking, we felt that the report form represented a reasonably sound coverage of the whole area. It was intended to be primarily a sampling device, and when the views so gathered are evaluated against other sources, it is believed a high degree of reliability as to the ultimate value of the survey results.

We also planned a number of interviews with Army, Navy, and Air Force contracting officers both in the Pentagon and in the field. This was discussed with Department of Defense officials who, on seeing the form on which information was to be solicited from Industry, suggested that fifty sets of the questionnaire be sent to contracting personnel selected by them. The individuals receiving the forms were urged to express their personal opinion, replying directly to the Commission, under a system that did not reveal their identity.

The response to the questionnaire has been most gratifying and the answers to the specific questions and the great volume of added comments provide a tremendous amount of information about how American Industry feels about Government contracting. In areas of major interests, there appears to be little difference of opinion. For example, the eleven electronic companies who answered voted eleven to zero on many of the important questions. Somewhat to my surprise Government contracting personnel are in substantial agreement with Industry.

Industry Appraises Procurement

It has taken some time to analyze this information and the report to the Commission is now being prepared. This report is due to be transmitted to Congress May 31, 1955. In the meantime, it may be of interest to the readers of SIGNAL to highlight some of the Electronics Industry's views on questions raised in the Task Force survey. I must admit to editing the language somewhat in the interest of better readability but this is about what they said -

1. If the Government is to attract Industry, it should adopt the normal industrial customer-supplier relationship which has as its foundation, mutual confidence and respect.
2. With a few exceptions, advertised bids should not be used in the procurement of electronic equipment. Effective competition can be secured by other means.
3. If you have built a mobilization base for particular equipment or component through the provision of facilities, then any procurement for such items should make use of these facilities.
4. Let's quit talking about profits and arbitrary profit limitation and place all the emphasis on the over-all cost to the Government which is, after all, what the taxpayer is worried about.
5. While it is hard on a good officer who has spent most of his life learning to be a soldier to have to serve as a purchasing agent, there appears to be no question that the rotation of such officers raises hob with procurement efficiency.
6. If you have picked a competent contractor (and no other should be dealt with), then why not let him assure you of the quality of his product. He probably knows more about it.
7. Again, if you have picked a competent contractor, why don't you let him run his own subcontracting program without looking over his shoulder.
8. Again, if you have picked a competent contractor and reviewed his accounting system, why not save time, money, and manpower by using spot checks rather than detailed audits.

(*Continued on page* 79, *Col.* 1)

FERRITES

a new material for microwave

by Charles DeVore
Naval Research Laboratory

A BASIC STUDY AT THE NAVAL Research Laboratory of the characteristics at microwave frequencies of the rediscovered materials known as ferrites has opened up an entirely new field in the development of electronic components which will enable equipment designers to achieve operational results previously thought unobtainable.

Since the Laboratory is a naval activity, this research is aimed first of all at military applications, such as radar—which, incidentally, originated at NRL. But just as radar has proved of importance for commercial marine and air navigation, so, too, it may be expected that military applications of ferrites in the microwave field will ultimately benefit, for example, commercial television.

What are these miracle materials, ferrites? They are ferromagnetic materials, which means that they contain iron and have magnetic properties. They are also ceramics and are subject to the same manufacturing methods and problems. Chemically, ferrites can be described as metallic oxides and symbolized as X Fe_2O_4, where "X" stands for a bivalent metal such as cobalt, magnesium, zinc, or nickel, for example. Being oxides, rather than pure metals, ferrites are very poor electrical conductors—good dielectrics—hence have high volume resistivities. Commercially available ferrites may have d-c resistivities as high as 10^6 ohms per centimeter, a factor 10^{11} higher than iron. High permeability is another characteristic of ferrites. This combination of high permeability and low conductivity makes for low losses, and has permitted reductions in size and weight of r-f magnetic components using ferrites.

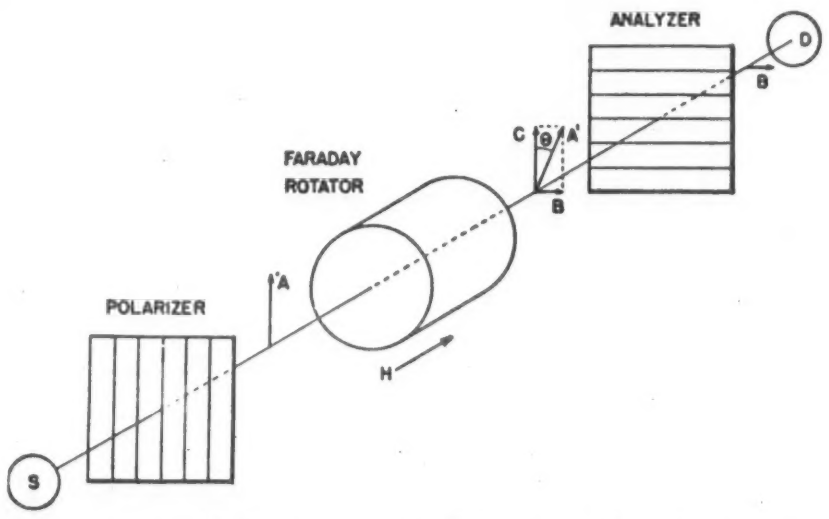
Ferrites were characterized above as "rediscovered" materials. Magnetic iron ore, or magnetite (Fe_3O_4) was known to the Greeks around 600 B.C. They had a word for it, too, lodestone. Some authorities believe it may have been known to other Europeans at an even earlier date.

Apparently, the first suggestion to use ferrites for electronic applications was made by a German scientist named Hilpert in 1909. Some additional studies were made by Dutch, French, German, and Japanese scientists during the 1930's. It was not until 1946, however, that much interest was aroused in these materials. In that year, a Dutch scientist named Snoek announced the development of ferrites having values of initial permeability above 1,000 at high frequencies. Since then, ferrites have found application as coil cores, filters, i-f transformers, tuning slugs, rod antennas (instead of loop antennas) for portable radios, high-voltage power supplies for TV apparatus, and loading coils for telephone cables. Additional applications have been seen for ferrites in pulse transformers and magnetic amplifiers, the latter use being suggested for computers.

In these various applications, ferrites have been used to replace silicon steel laminations, iron wire and powdered iron to produce components with improved electrical characteristics with reductions in size and weight.

Although the low-frequency uses of ferrites are important, it is in the microwave field that new and unusual possibilities exist. In this field, on the basis of results already obtained at the Naval Research Laboratory, ferrites promise achievements not previously considered theoretically possible, let alone practical.

One of the important investigations of ferrites being made at the Microwave Antennas and Components Branch of the Naval Research Laboratory is their application to the solution of the microwave antenna problem. This work is supported by the Bureau of Ships. The design of rapid-scanning antennas is a problem of long standing in the field of microwave antennas. In many radar ap-



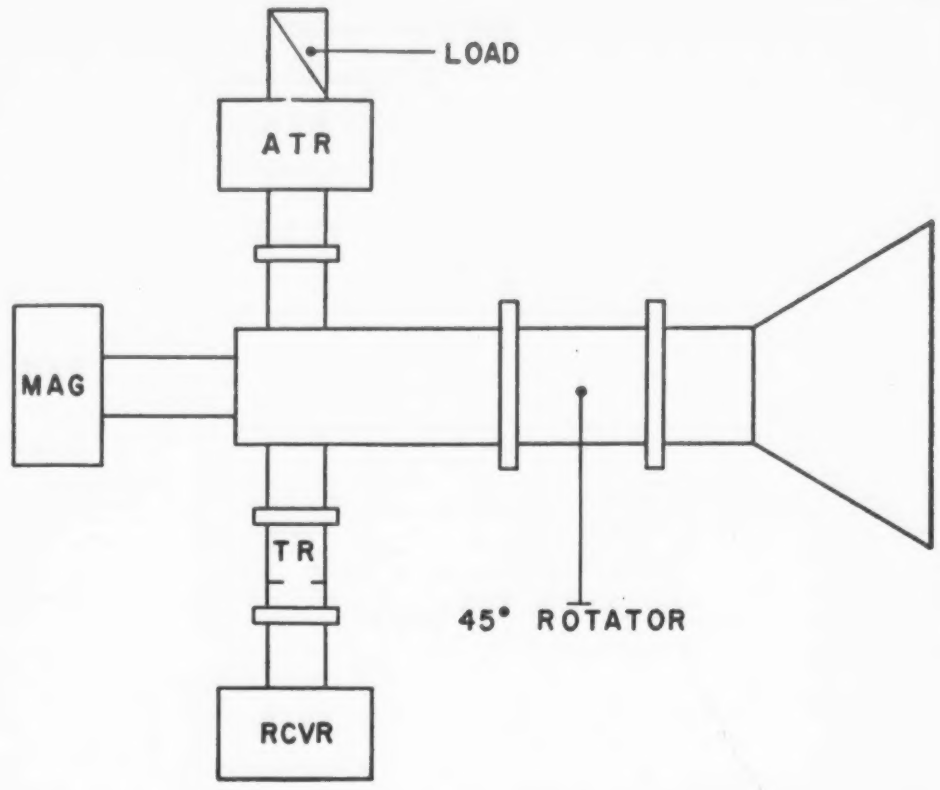
Ferrites show the Faraday optical effect at microwave frequencies. Radiation from a microwave source, S, falls on a polarizer (wave-guide) which transmits only a plane-polarized wave as represented by the vector A. This wave travels through the ferrite section, and, in the presence of a magnetic field, H, parallel to the direction of propagation, is rotated through an angle θ. The wave now may be represented by the vector A', with two components, B and C. In passing through the analyzer (another wave-guide), component C is stopped, only component B passing through to the output, D. A change in the strength of the applied magnetic field changes the angle of rotation and a corresponding change in the component of the generated energy which will reach the output. In a practical design, means are provided to keep component C from being reflected back to the source.

plications, such as target search and detection, gunfire and missile control, and homing, radiation beams of various widths and shapes must be moved rapidly through a given angle. When the antenna is small, as in gun-laying radars, the entire unit may be ground-based radars; however, this direct approach cannot be used, so that ingenious schemes have to be devised to shift the beam position without moving the bulk of the antenna. Unfortunately, these schemes frequently result in mechanically complicated structures which are not only hard to construct and to maintain mechanically but which also impose limitations on the electrical performance of the radar system.

But couldn't beam scanning be effected by moving the beam instead of the antenna? True, and this has been a goal of the microwave antenna designer ever since the beginning of the scanning problem. One attractive method of moving a beam without moving the antenna is to shift relative phase between the signals radiated by elementary antennas making up an array. The array elements may be fed by tapping off a feed line at regular intervals, or by branching the feed line, or they may be field-fed from a parallel-plate "pillbox" source. In any case, a phasing element may be inserted in the transmission line just ahead of the radiating element. Rapid scanning by this means has been limited by the fact that the only available lossless phase shifters operate mechanically by means of a moving waveguide or dielectric section. So the disadvantages of mechanical scanning have not been entirely eliminated.

An electronic means of shifting phase, if it could be made practical, would seem to be the answer. It would have the potentiality of producing a rapid-scanning antenna which is also mechanically simple. A possible way to shift phase electronically is to use a material whose dielectric constant or whose permeability may be changed by external d-c or low-frequency electric or magnetic fields. Such materials, inserted in wave-guide or coaxial line would, upon application of the external field, cause a change in electrical length of the transmission line, equivalent to a shift in phase. Materials such as the titanates have variable dielectric constant, but they have proved too lossy for antenna applications. How about materials of variable *permeability*—for example, ferrites?

In looking into this possibility, scientists in the Microwave Antennas and Components Branch at NRL found it necessary to set up a ferrite research project, for in 1951 there had been little investigation of the microwave applications of ferrites and less published data. A new type of microwave switch using ferrites had recently been introduced by C. H. Luhrs, however, and its operation encouraged the NRL scientists in their investigations.



Ferrites made possible the isolation of the generator from the load. When the magnetron fires, both the TR (for transmit-receive) and the ATR (for anti-TR) switches are closed. The output of the magnetron is rotated 45° in passing through the 45° ferrite rotator, and then proceeds to the antenna. If any power is reflected by the antenna, it comes back down the transmission line, passes through the rotator and is rotated another 45 degrees in the same direction, for a total of 90 degrees. The reflected wave therefore cannot enter the input and must proceed up one of the two side arms. Since the TR and ATR are still closed, the reflected wave proceeds to the upper arm and is absorbed in the load. By the time the echo reaches the antenna, both the TR and ATR are open and the reflected energy proceeds to the receiver.

The Luhrs microwave switch, essentially, consists of a section of dielectric-filled circular waveguide in which a piece of ferrite rod is axially located. A coil is wound on the circular waveguide to provide an axial magnetic field. The input to the ferrite section is a rectangular waveguide and the output another length of rectangular waveguide which is rotated 90 degrees about its longitudinal axis with respect to the input waveguide. With the ferrite unmagnetized, there is about 50 db isolation between the crossed waveguides. When the proper current is supplied to the coil, however, the ferrite rotates the plane of polarization of the energy 90 degrees and the input and output guides are coupled. This electrical rotation of the plane of polarization is the mircowave analogue of an optical effect first discovered by Faraday in 1848 and named for him.

Looking toward the ultimate goal of ferrites for microwave antenna applications, the NRL scientists decided to measure the microwave characteristics of the available ferrite materials. These properties included phase shift, attentuation, power-handling capacity, and losses of various shapes and sizes of ferrites in both circular and rectangular waveguide and with both longitudinal and transverse applied magnetic fields. Measurements were confined to the microwave region. Since there was no known precedent for this work, it was necessary to devise methods and equipment which would be suitable. At the time these physical measurements were being made, another scientist in the branch was making theoretical studies of the propagation modes in both circular and rectangular waveguides completely and partially filled with ferrites. He arrived at formal, mathematical solutions which indicated that the formulas which held true for ordinary waveguides no longer applied to waveguides containing ferrites. This theoretical study explained rather strange behavior of ferrites that were observed in the laboratory.

The physical measurements confirmed earlier investigations that it was possible to vary electrically the phase of microwave fields using ferrites. They also showed that this phase shifting effect varied with changes in length, dimensions and positions of the ferrite in the waveguide, as well as with the various physical properties of the commercial ferrites tested. For example, it was found that the phase shift per unit length for a given diameter rod is a function of length, increasing as the length increases. A similar effect was noted for change in diameter for rods

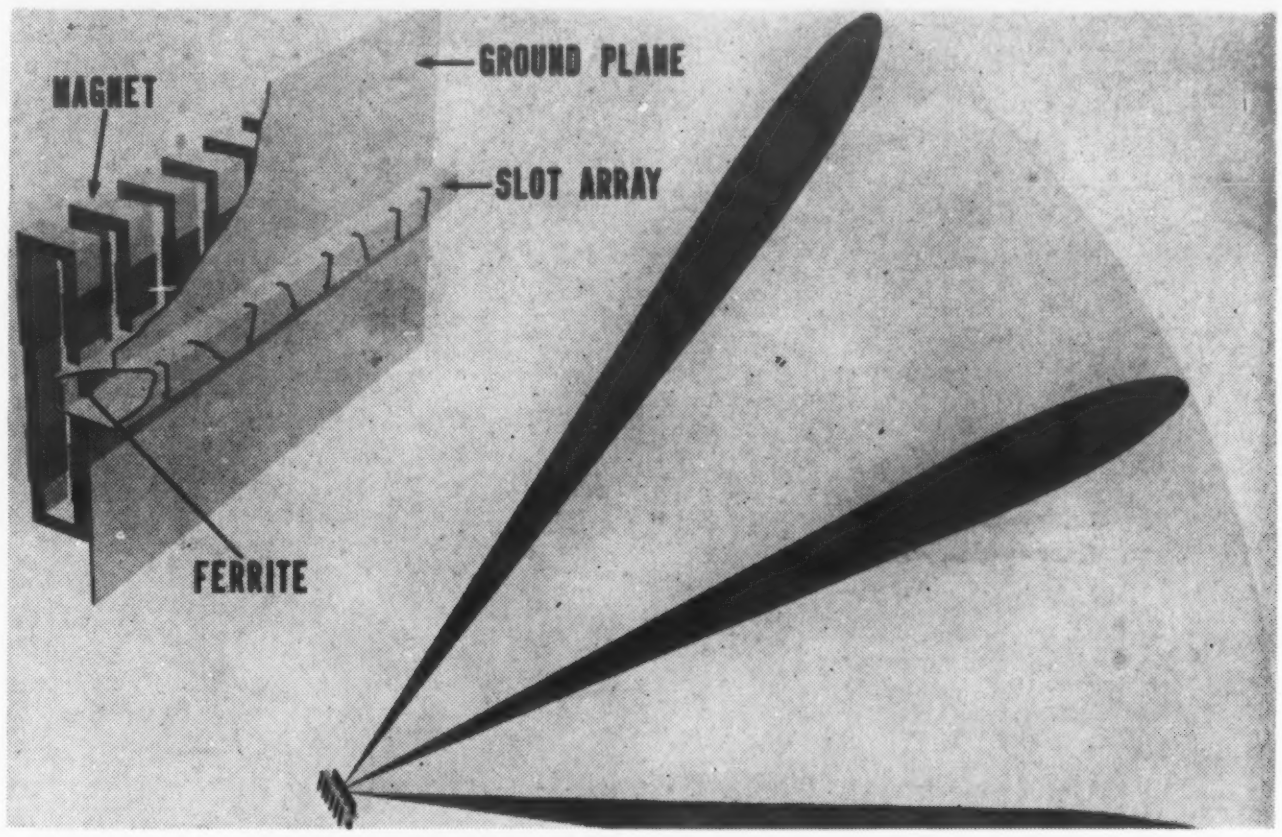
of a given length. The NRL scientists discovered that phase shift could be obtained in rectangular as well as in circular waveguides and thus the loss per degree of phase shift could be minimized by the right combination of ferrite and its position in the waveguide.

These results were sufficiently encouraging for the scientists to build a laboratory model of an antenna array whose beam could be electronically scanned. It consists of a series of shunt slots cut along the edge of a rectangular waveguide. Pieces of ferrite are located behind and between the slots and energized by small electromagnets in such a way as to change the phase at each slot progressively, thus causing the radiated beam to scan.

Another important application which is being studied at NRL is the isolation of the generator from the load. Such a device would make possible many antenna designs—and particularly scanning antennas—which have had to be rejected in the past because of the various impedance they have presented to the generator. Various schemes are being studied. An accompanying sketch shows one possible arrangement.

It was mentioned earlier that the studies of the propagation characteristics of ferrites in waveguides explained some strange observed phenomena. That was this: with ferrites, it was possible to build a *one-way* transmission line, which would transmit most of the microwave energy for one direction of propagation, but absorb it for the reverse direction! This is a violation of the reciprocity theorem, which states that you can interchange a generator and a load without affecting the transfer of energy through the connecting transmission line.

This nonreciprocal property of ferrites has been used by the NRL scientists in two ways to design one-way transmission lines. The first of these is an absorption type: for one direction of propagation, a large amount of energy is absorbed, whereas for the other direction, absorption is relatively small. A typical component built to operate in the X-band presented 16 db of attenuation one way and only 0.2 db the other, over a 400-mc band.



Through the use of ferrites, the beam of this radar antenna, rather than the antenna, moves to scan for a target. Small pieces of ferrites are located between the slots in the waveguide and are energized by the electro-magnets. The antenna beam is electronically scanned by varying the current through the coils of the magnets.

A second method, which has the advantage of avoiding the heat-dissipation problems arising from the absorption type, makes use of the fact that it is possible to design a section of ferrite-loaded waveguide which *reflects* most of the power for one direction of propagation, but transmits most of the power for the other. Such a component, also built at X-band, had 0.5 db loss going from generator to antenna and 0.2 db loss from antenna to receiver.

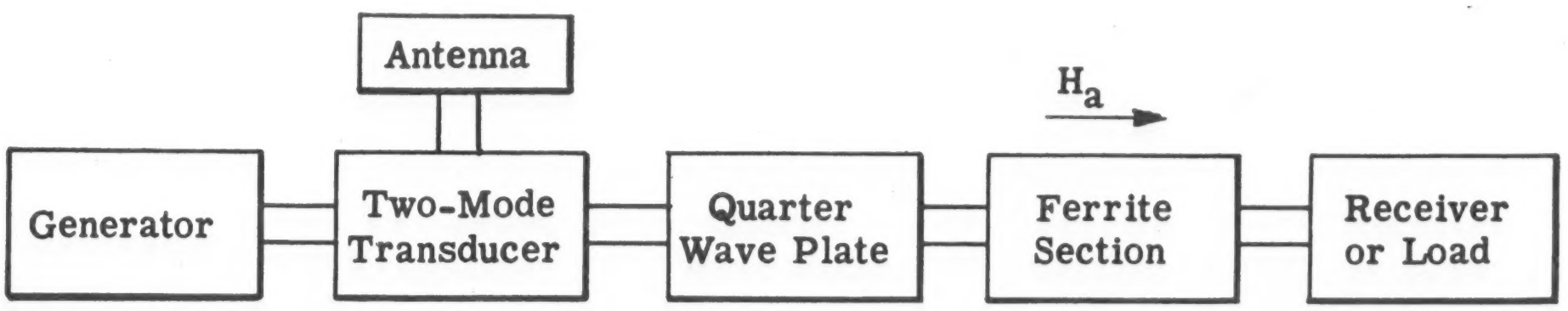
And so these unique phase shifting and nonreciprocal properties of ferrites have opened a vast new field of microwave applications. There are still many problems to be solved before these components can be used, for example, in present-day radars. One major problem is the development of improved ferrite materials for use at these higher frequencies. Work is going on in this phase at the U. S. Bureau of Mines in cooperation with NRL.

In the Ferromagnetics Branch at NRL, a study is being made of the magnetic and dielectric properties of ferrites in the non-magnetized state over the frequency range of zero to 10,000 megacycles to get some basic information on the various loss-mechanisms in this material. This group is also investigating such basic characteristics of ferrites as relaxation frequency, saturation, magnetization, g-factor, in an attempt to determine which properties are inherent to ferrites, and which they have because of their shape or because of their position in an r-f system.

In addition to the work in the Microwave Antennas and Components Branch, the Tracking Branch of the Radar Division has developed a microwave sweep oscillator which sweeps the range of 8,500 to 9,500

(*Continued on page 77, col. 3*)

Ferrites can be used to design one-way transmission lines. When the applied static magnetic field is properly adjusted, power will proceed from the generator to the antenna, whereas power fed into the antenna will proceed to the receiver. If a magnetron is used as the generator, conceivably the ferrite, magnetic field, and magnetron could be combined as one "package," effecting appreciable reduction in radar components.



Benjamin S. Hamilton, Jr., winner of General Electric's annual Edison Radio Amateur Award, instructs Jackie Fouchee in Morse Code. A feature of the outstanding public service that won Hamilton the award is his two-nights-a-week class of 20 radio trainees for civil defense operations.

Edison Would Be Proud

DISTINCTION FOR BEING the country's top-ranking amateur radio operator this year went to Benjamin S. Hamilton, Jr. of La Mesa, California.

Recipient of the General Electric 1954 Edison Radio Amateur Award, Hamilton is the owner and operator of W6VFT and MARS station A6-VFT. At the award presentation banquet, held in Washington, D. C. on February 10th, J. M. Lang, general manager of the G-E Tube Department, sponsors of the Award, presented the trophy to Hamilton.

Hamilton's selection for "outstanding public service in 1954 by a 'ham' operator" came as the result of his work in setting up the Civil Defense and disaster emergency radio network for San Diego County, California.

Hamilton volunteers about 20 hours a week to this emergency radio

Ben Hamilton, holding the Edison Award trophy, receives congratulations from Val Peterson, Federal Civil Defense Administrator, who delivered the main address at the presentation banquet. Mr. J. M. Lang, general manager of the G-E Tube Department, sponsors of the award, looks on.

work. He has provided his 750,000 neighbors in San Diego County with an active 200-man civil defense radio system that is one of the best in the nation.

The award winner organized the amateurs, integrated them into the over-all civil defense group, and supervised technical communications surveys to see what type of equipment would best serve their needs. He planned the networks, wrote equipment specifications, and designed and laid out the required physical facilities.

His radio networks link together 36 of the 44 communities of a county 70 miles long and 60 miles wide, overcoming the many difficult technical communications problems presented by the varied terrain of hills, coastline and desert.

Peterson Praises Amateurs

In the principal address at the banquet, Val Peterson, Federal Civil Defense Administrator and one of the four judges for the Award, cited the contributions of the 120,000 "ham" operators throughout the country in times of emergencies. He emphasized in particular the invaluable assistance they have given disaster areas at the times of hurricanes, floods, fires, etc., and said that these experiences point up the need for amateur radio operators in the civil defense system. One of the biggest advantages of amateur radio communication in a time of enemy attack, he said, will be their dispersal. With stations located in their homes, some at great distances from cities, in the immediate aftermath of an attack, "ham" stations are likely to be the only means of communication.

In a message which Hamilton keyed from the head table at the banquet to all amateurs in the nation, via MARS facilities, Mr. Peterson said:

AS WE HONOR TONIGHT ONE OF AMERICA'S OUTSTANDING RADIO AMATEURS, W6VFT, WINNER OF THE 1954 EDISON RADIO AMATEUR AWARD, I EXTEND SINCERE CONGRATULATIONS TO EACH OF YOU FOR YOUR PREPAREDNESS AND READINESS TO SPRING INTO ACTION IN ANY EMERGENCIES.

Brig. Gen. W. B. Larew, Chief, Army Communications Service Division, OCSigO, points out Mr. Hamilton's home town in San Diego County, California, on the MARS giant map at the Pentagon.

At the award banquet, Brig. Gen. James Dreyfus, representing the Chief Signal Officer, Maj. Gen. George I. Back, gave Hamilton a Certificate of Appreciation for his MARS work.

At the San Diego County Civil Defense headquarters, Gillespie Field, El Cajon, Calif., Hamilton (standing left) conducts a communications drill. Youngster at the sets at right is Roger Smith, 9, one of the nation's youngest licensed "hams" and a qualified radio operator for civil defense. His mother, Deane Smith (typing message), and father, J. Roy Smith (behind Hamilton), also are licensed amateurs.

Quotes in Review

a survey of major statements made during the past two months

"Perhaps the most important thing the Communists have done has been to modernize their educational system and to orient it strongly toward the physical sciences and industrial technology. As a result of very comprehensive work along these lines, they have increased their scientific and technological potential by an order of magnitude, and, as others have pointed out, they are today turning out engineers and scientists at more than twice the rate we are in this country. If current trends continue, it will only be a matter of a few years before their scientific and technical manpower exceeds our own.

* * *

"It is thus important for us to work toward national policies that enhance and conserve engineering manpower. The dilemma we are now in about drafting engineers is a case in point. There are good policy reasons for insisting that no young man escape the sacrifice that other young men must make in military service. On the other hand, engineers are scarce and, if we are to sustain a program that will keep us out ahead in this technological race, our needs for engineers and scientists must be expected to increase rather than decrease.

"It is a problem that we must deal with on a strictly national-interest basis. If we are to win this race, our manpower must be disposed to our greatest national advantage. The military services require some specialists in the performance of their missions. Beyond this, we cannot afford to put engineers and scientists into uniforms."

Donald Quarles
Assistant Secretary of Defense (Research and Development)
Assembly of the Engineers Joint Council

"Communications is the lifeblood of democracy. An informed and intelligent electorate is our bulwark against chaos. Education of the people is dependent on the means of communication that are available. In its simplest form, a teacher talking to a group of pupils, communication is an essential element. But in the more complicated processes by which the citizens of a democracy become informed the problem of communication is more involved and extensive. Today we have intricate and powerful means for the interchange of thought among the entire population. On the skill and wisdom with which these means are employed depend the stability and prosperity of our Republic."

Vannevar Bush
President
Carnegie Institution of Washington
American Society of Mechanical Engineers

"Communications is an indispensable part of all civil defense services. While the telephone is now our basic means of communication in civil defense, radio plays a vitally important "back-up" role and in this regard, radio amateurs like Benjamin Hamilton are performing a wonderful service to this country.

"The worst situation people can be in is to be isolated from one another. Isolation breeds panic. People will not panic when, through adequate communications, they are well informed. Amateur radio is an important part of this information network."

Val Peterson
Federal Civil Defense Administrator
Edison Radio Amateur Awards Dinner

"We are no longer living in a relatively comfortable world of space and time advantages—by which I mean a world lacking the speed of jet bombers, and one in which oceanic barriers and Allied forces were effective military assets in the initial stages of a conflict.

"We all know better today. The incredible technological advances of the past decade alone have obliterated these considerations as "safety" factors on which to base our defense thinking. We are only too well aware that war could come to us without warning at supersonic speeds, and with great destructive violence in our midst.

"I don't need to tell this audience that it takes time to

train men in the techniques of modern warfare, and that without men already trained at the outbreak of war our military establishment would have the gravest difficulties in assembling them.

"The National Reserve Plan recognizes this primary fact and does something about it. It offers what a nation occupying our position in world affairs really needs, and that is a *mandatory* program whereby the defense requirements essential to our security are maintained at safe and ready levels.

"It calls for active forces strong enough to ward off an initial blow and to cope with effects of any national disaster. Basic, however, is its provision for a trained reserve which could be moved into action if needed and which would be immediately effective once so committed."

Carter L. Burgess
Assistant Secretary of Defense
(Manpower and Personnel)
Reserve Officers Association
Washington, D. C. Chapter

"It becomes more apparent every day that our system of education is being posed with a greater challenge than we have ever known before. Both in government and industry, there is an ever-growing need for a wider understanding of the interrelation between sound economics and national security. The time has passed when it is enough for a military man to be familiar with the tactics of his particular service arm or for the civilian to pleasantly limit himself to the civic affairs of his own community.

"The nature of the world we live in is such that if general war should come again, not a man, woman or child would be unaffected; more than that, virtually every citizen would be confronted with the responsibility of his own personal care in a desperate effort to survive. This stark reality is being brought home to people as never before by the growing awareness that we are no longer insulated by the oceans and the Arctic wastes. If this great test of national effort should ever come, every military man would be vitally concerned with the affairs of industry and civilian defense; and every non-uniformed contributor would, in some measure, need to have knowledge of military requirements in order that they can intelligently be supplied and fulfilled. Toward the top of the ladder of national effort, where the great decisions must be made, there will be a corresponding requirement for a greater and broader understanding of human affairs. All of these things point to a need for broadening the scope of our national educational system with the difficult concomitant of increasing the amount of actual precise knowledge of an ever-expanding list of subjects. Actually, these are the only principals on which an effective educational structure can be built."

Admiral Robert B. Carney, USN
Chief of Naval Operations
The Citadel,
Charleston, South Carolina

". . . there is no air power in equipment that has to be taken from combat wings and put through lengthy modification to realize its initial promise. Such practices, always wasteful, are often necessary in times of emergency, but they are intolerably expensive to forces in being.

"These deficiencies are the often unavoidable products of the crash program approach to weapons production. If the political or military situation demands crash programs, they are essential and must be tolerated. While the waste in time and money is great, it is nothing to the alternative risks to national security.

"However, in the age of peril, it is clear that we must avoid any haphazard crash program. Not only would this cost too much if we are to have an expanding economy, but the very military facts of life make it impossible for two reasons: First, nuclear weapons and long-range airplanes on both sides means that we must maintain a high level of readiness rather than a series of peaks. Second, the complicated weapons of today are taking continually increasing lengths of time. Clearly, we will have neither qualitative superiority nor readiness if we try to program to the ebb and flow of the military and political situation and ignore the fundamentals of the technology from which we draw our strength."

Roger Lewis
Assistant Secretary of the Air Force
Institute of Aeronautical Sciences

"The purpose in reviewing the development of the scientist-engineer relationship is to set the stage for a further obligation.

"This is the necessity for both the scientist and the engineer to become familiar with, and to develop skills in areas broader than, the technology for which they are basically trained. The scientist-engineer relationship must be broadened to include the arts, the humanities, and politics. These will be the needs in the future in order that the scientist and engineer may discharge with competence their growing responsibilities.

"Given the proper exercise of these responsibilities, there is no apparent limit to the technological progress and consequent prosperity and well-being that lie ahead for all of us. Already the development of swift and sure communications and transportation facilities have had a profound effect upon the world in which we live. Domestically, we have seen a steady rise in industrial productivity and corporate efficiency, aided by continually improving means of communications. In our daily lives, we have been brought into ever wider contact with our fellow men at home and abroad."

Dr. E. W. Engstrom
Executive Vice President
(Research and Engineering)
Radio Corporation of America
American Society of Mechanical Engineers

Wanted: A Radio Frequency

a game of hide-and-seek in the radio spectrum

by John D. Corley and
Major Verden McQueen, USAF
Directorate of Communications, USAF

COMMUNICATIONS AND ELECTRONICS have become so much a part of military operations that the quantity and quality of radio frequencies available in time of war may well be a decisive factor. There seems to be no limit to the amount and variety of equipment that must be built to aid the combat commander, but with increasing use of such aids, there is a proportional decrease in the availability of radio frequencies on which to operate the equipment.

Our ingenious systems and expensive equipment are worthless unless we put them on the air, and we cannot put them on the air without a legal transmitting wave-length, or frequency. We now use more of the radio spectrum than ever before, and we find it more difficult than ever to get frequencies. Perhaps we could never build and man all the radio stations we need, but we could certainly produce many more than the radio spectrum could accommodate. It is not the facilities, but the frequencies, that hold us back.

Most laymen, and many communicators, are baffled by this apparent road-block to progress. Military and civilian experts alike are trying desperately to find a way out of the predicament. The problem becomes especially acute at the departmental level of our government where authority to assign frequencies is concentrated.

Major General Gordon A. Blake, USAF, as Director of Communications, is well aware of the problem because he is responsible for the control of all the radio frequencies used in the Department of the Air Force. Similar centralized control is maintained in the Army, the Navy and other Government departments. Responsible communications leaders from various agencies of the federal government, acting collectively as a national frequency staff, assist the President in carrying out his lawful obligation to assign frequencies for government-operated radio stations. This staff works constantly to find ways of easing the frequency problem.

The Communications Act of 1934, which requires the President to assign radio frequencies to government radio stations, gives the Federal Communications Commission (FCC) a parallel responsibility over non-government radio frequency assignments. In short, the frequency problem concerns everyone who uses a radio, and everyone is looking for an answer to the riddle.

The FCC has over a million amateur and commercial radio licensees on its records, and the Defense Establishment is a phenomenal consumer of frequencies. The density of FCC licensees alone is about one licensee for every three square miles of real estate in the United States. *The very fact that hundreds of thousands of military and civil users can operate radio stations harmoniously within the relatively small geographical area of the United States is a tribute to those who do the detailed work of allocating and selecting the frequencies which are currently assigned.*

The meticulous way in which frequency allocators protect existing assignments often goes unnoticed, and the stringent manner in which they scrutinize each new request does not make the allocator popular; but these are the means of maintaining order. If the rights of present operators were neglected for the sake of satisfying every new requirement, an electromagnetic Babel would ensue, and no one could pass any traffic. On the other hand, if new developments such as single-side-band, multi-channel frequency-shift-keying and picture transmission were discouraged, there would be no progress. Not only must we justify new requirements: we must also justify the continued use of present assignments. In some instances, we must even discontinue an old assignment to accommodate a new assignment of higher priority. Consequently, the old and the new are always in dynamic equilibrium, and the two are kept in balance only by constantly weighing and reweighing the merits of each.

Once a new radio operation is justified and approved, the process of clearing and coordinating the frequencies can begin. This process is complicated and arduous. It involves a great amount of time and effort, and each frequency assignment follows a different pattern. However, a specific example of a frequency assignment problem in the high-frequency portion of the spectrum may help to illustrate some of the principles of frequency allocation.

Let us suppose that the Air Force

has a requirement for a manual CW radio circuit from Seattle, Washington, to San Antonio, Texas. We will have rhombic antennas at both locations, and the input power of the Seattle transmitter will be one kilowatt. The circuit is to be operational by the first of July. Our problem is to select, coordinate and assign the frequencies for the new circuit.

Our first step is to determine what frequency range we can use. This preliminary selection of usable frequencies is based primarily upon the radio wave propagation data published by the Central Radio Propagation Laboratory (CRPL) of the National Bureau of Standards. There are several frequencies which would offer maximum dependability at various times on a Seattle to San Antonio circuit, but we will limit our problem to the choice of a frequency which will be usable during the early morning hours. From the propagation prediction data in Figure 1, we find that we must have a frequency somewhere between 3.2 and 4.5 megacycles if we are to realize 90% reliability at 0330 hours. Our best frequency would be 4.5 megacycles because we could use this frequency from 1800 to 0600 hours. We could also use 3.2 megacycles, but only for an hour or less. However, if we had a frequency between 3.5 and 4.5 megacycles, we could use it for a period of at least four hours.

The purpose of our preliminary survey was to limit our area of search to those frequencies which were technically and practically feasible. Out of the whole spectrum, we have found that only those frequencies between 3.5 and 4.5 megacycles will fill our need.

Now that we have defined our area of search, we are ready to look at the allocation tables to see what increments of frequencies are available within the 3.5 and 4.5 megacycle band. Figure 2 is a summary of that portion of the Atlantic City Table of Frequency Allocations which contains the 3.5 and 4.5 megacycle band.

Since the United States is committed to respect the Atlantic City Convention of 1947, and since our new circuit will provide a fixed service, we must not choose a frequency from the aeronautical, mobile and amateur bands. This automatically eliminates 875 kilocycles, or 87.5% of the spectrum between 3.5 and 4.5 megacycles, and we have hardly begun our search. But there are still 125 kilocycles from which to pick.

Apparently there is still a lot of room, but our new frequency must conform to at least one of three commonly accepted criteria in the 125 kilocycle space that remains:

1. *Frequency Separation.* Will the new frequency have enough spectrum space on either side to guard against mutual interference with the operations on adjacent frequencies?
2. *Geographical Separation.* Will the new frequency be used with a radiation pattern which will not overlap the receiving locations of other circuits on the same frequency?
3. *Time Separation.* Will the new frequency have different times of operation than other assignments on the same frequency?

None of these criteria is new. On the contrary, we have already reached the point of diminishing returns because their use does not allow for enough new assignments. Frequency separation, with its emphasis on clear channels, was supplemented long ago by geographical separation. Geographical separation, in turn, was soon disregarded if time separation could be had.

The criterion of time separation is largely a technical matter based on propagation characteristics: e.g., two New York stations might be able to use the same frequency if one station worked the Azores and the other worked Hawaii. During the next ten years, time separation, based on average propagation limitations, may be supplanted by "compulsory time-sharing," wherein the permissible hours of use of a frequency will be specified. While such a refinement would not increase the total usable time for any given frequency, it would increase the number of assignments that an allocator could make. On the other hand, it would require distinctly limiting restrictions and a large measure of centralized control to make it effective.

Unfortunately, or perhaps fortunately, we do not have compulsory time-sharing yet, and we still need a frequency for our Seattle to San Antonio circuit. Our next step is to scan the current authorizations of military users. Figure 3 is a paraphrased extract from a military frequency assignment book. It shows how thoroughly the Armed Forces exploit their frequencies, and is typical of the saturation in the spectrum below 30 megacycles. Remember that we have already lost 87.5% of our 3.5 to 4.5 megacycle band if we abide by the Atlantic City Convention. After screening the military assignment book we discover that we are deprived of another 8%. The odds are now 95.5% against us.

From the small remaining available space, we select several of the most promising possibilities. In view of joint military interest in use of the spectrum, we announce our intentions to frequency allocation personnel of the Army and Navy. If either Army or Navy is not in agreement with our proposals, the frequencies are abandoned and the whole procedure is repeated. During this process of inter-service coordination, we are likely to lose another 4% of the 3.5 to 4.5 megacycle band. We are now cut off from 99.5% of the space we need for our Seattle to San Antonio circuit, and we have not even begun to coordinate officially. It is still necessary to solicit

Figure 1. Optimum (FOT) and lowest usable (LUF) frequencies, in mc/s, for July on 1500-mile path using 1 kw and rhombic antennas.

Local Time	FOT	LUF
0000	6.2	3.7
0100	5.6	3.4
0200	5.1	3.2+
0300	4.7	3.2+
0330	4.5	3.2
0400	4.9	3.2+
0500	8.2	3.5
0600	10.7	4.0
0700	12.7	4.7
0800	14.3	5.3
0900	15.2	5.7
1000	15.8	5.9
1100	16.0	6.1
1200	16.0	6.2
1300	15.7	6.2
1400	15.5	6.1
1500	14.2	5.9
1600	13.5	5.5
1700	12.8	4.9
1800	12.0	4.3
1900	11.9	3.8
2000	11.3	3.6
2100	10.0	3.5
2200	8.2	3.5+
2300	6.8	3.6
2400	6.2	3.7

formal comments from the Army and Navy, and the various other government agencies. This is done by submitting an application to the Interdepartment Radio Advisory Committee (IRAC).

The purpose of IRAC is to assist the President in radio matters which involve government activities. Its prime function is to make sure that all government assignments are properly justified and that national interests are protected. Under the supervision of the Director of the Office of Defense Mobilization (ODM), IRAC considers the over-all requirements of the various departments, assigns government frequencies, and maintains the government's frequency assignment records. It is composed of representatives from the nine government agencies which are most interested in using radio in carrying out their responsibilities.

Much of IRAC's routine work is administered by a Frequency Assignment Subcommittee (FAS). The FAS reviews applications for specific frequencies and makes assignments in accordance with established policy. FAS membership is extensive and is open to any government agency which has an interest in using radio frequencies.

Nearly all FAS and IRAC meetings are attended by representatives from the FCC. It could hardly be otherwise. Government and non-government uses of radio frequencies are so closely interwoven that neither can be administered without taking the other into account. Therefore, every Air Force application is reviewed in consideration of its impact upon both government and civil operations. If a member of FAS shows that our choice of a frequency violates separation criteria, and interference is likely, or that our proposed use is inconsistent with national policy, our application may not be approved. No one individual or agency can help themselves to a radio frequency.

Let us suppose that we are lucky, that we finally get authority to use the frequency we need for our Seattle to San Antonio circuit. Can the Air Force make the assignments and forget them? Not yet. There is still the possibility of unforeseen interference, either within the United States or in Canada and Mexico. In that case, we may find that we must respect the prior rights of another sovereign power and look for another frequency. In some cases, an assignment may hinge on the results of a temporary trial period, and may need to be replaced because it is not compatible with other assignments. In any case, we will have to protect the assignment by registering it with the International Telecommunications Union (ITU), by giving comments on later proposals by other agencies and by negotiation with other countries if new foreign stations cause unacceptable interference.

These, then, are some of the reasons why the ideal frequency for a given circuit at a particular time of day is so hard to get. This is why it takes so long. The problem is more complicated for circuits which have overseas terminals. In Europe, for instance, we would have to coordinate any new frequency with the European Radio Frequency Agency (ERFA), whose mission is to plan military frequency allocations for NATO.

Band (kc/s)	Type of Service Authorized
3400-3500	Aeronautical mobile
3500-4000	Amateur
4000-4063	Fixed
4063-4438	Maritime mobile
4438-4650	Fixed and mobile, except aeronautical mobile
4650-4750	Aeronautical mobile
4750-4850	Broadcasting and fixed
4850-4995	Broadcasting, fixed and land mobile

Figure 2. Summary of a portion of the Atlantic City Frequency allocations for North America.

The foregoing example of a frequency allocation problem has been deliberately over-simplified to highlight the fundamental problems. It is typical of the difficulties which are encountered before a high frequency can be assigned. Although the propagation aspects differ greatly for frequencies above 30 megacycles, the difficulties are similar for all other bands of frequencies. The example shows the time and effort spent in processing new requests and in coordinating proposals between agencies. It was given in an attempt to show how the shortage of frequencies is becoming more acute daily, and to explain why the chances for the assignment of a new frequency are approaching zero.

We must accustom ourselves to the fact that the radio spectrum is no longer an open frontier. *It has become as much of a national resource as oil or tin or iron, but, unlike natural resources, we cannot put reserve radio spectrums into a convenient stockpile. Nor can we conjure up a synthetic product for war-time consumption. We have but one radio spectrum, and that spectrum is inflexible.*

Although compulsory time-sharing and precision equipment might ease matters for a while, there seems to be little hope for permanent relief. If any thing, the situation will become worse instead of better, and we will avoid a serious frequency famine only if operators and allocators alike continue to exercise good judgment in managing present assignments, and continue to cooperate wisely in making room for new requirements.

Figure 3. How military users might share the frequency 4500 kc/s and adjacent channels.

User	Use	Type	Emission	Watts	Frequency
Navy	Guam to Kwajalein	Fixed	0.1A1	3000	4496
Navy	Alaska to Seattle	Fixed	2.85F1	10000	4496
USAF	Washington, D. C. to Oakland	Fixed	2.85F1	15000	4500
Navy	Atlantic	Mobile	1.1F1	500	4500
Army	Tactical and Training, U. S.	Mobile	6A3	100	4500
Army	Anchorage to Adak	Fixed	2.85F1	15000	4500
USAF	UK to Tripoli	Fixed	2.85F1	3000	4500
USAF	Training, Alaska	Mobile	6A3	500	4500
Army	Panama to Miami	Fixed	1.1F1	10000	4500
Navy	South Pacific	Mobile	0.1A1	500	4500
Army	New York to Bermuda	Fixed	1.1F1	10000	4504
Navy	Azores to W. Africa	Fixed	2.85F1	3000	4504

HUMAN

COMMUNICATIONS

At Fort Monmouth, where all types of communication are studied, two of the three R's—readin' and 'ritin'—receive special attention

by R. G. Ranney

Signal Corps Engineering Laboratories

CAPTAIN SMITH OF COMPANY Q received this message from Troop Command:

> This headquarters conducted a study of all motor vehicle accidents investigated by Provost Marshall during the period 1 January to 31 December, for the purpose of deriving statistical data as to the causes of these accidents for implementation by unit commanders to the troops during troop discussion periods as a possible means of reducing these accidents.

Captain Smith and the other company commanders called in questioned: "What do you mean by implementation? What am I to do?"

A great deal of the correspondence coming in to the Signal Corps Engineering Laboratories is just as confusing — not just that from "government bureaucrats" either; letters from outside contractors are just as hard to follow. We know that we write our share of poor letters, but we're trying to improve.

Part of the trouble, of course, is unskilled reading. Even a well-written piece won't produce clear communication if read illogically or without proper evaluation. In order to improve the situation, we began with an extensive testing program to measure existing skills. We knew that we wanted to improve communication, and we decided to start with reading.

Because our problem involves the comprehension of different material, we used the highest level standardized test put out by the American Council on Education. Questions, asked after the reading, require the student not merely to remember what he had read, but also to evaluate and interpret, and to draw reasonable inferences and logical conclusions. Scores are given in terms of percentiles showing relative placement among typical college graduates. The 50th percentile, or average, can be attained by a surprisingly small degree of accomplishment, an indication of the generally low level of reading skill.

For the 1600 employees tested then and later the average score was 39, with some responsible workers at the very bottom of the scale. (Lest anyone consider this an indication of the mediocrity of government workers, I should mention that the same tests given to officers and executives of large corporations have produced the same results.) Scores made by officers were comparable to those for civilians.

It is probable that the persons tested would have done better when they were in college, before they had lapsed into inflexible reading patterns. It is true also that engineers, like lawyers, accountants, and other specialists, tend to be poorer-than-average readers. Their training emphasizes detail and they have a tenddency to devote so much attention to single words that they lose the thought of what they are reading. It may be some comfort for the man who is aware of his shortcomings in reading to know that he has plenty of good company.

To blame this lack of skill on inadequate preparation in the schools is easy, and probably justified, but it doesn't solve the problem that confronted us. Our engineers needed greater skill in reading in order to make them more productive.

We knew, too, that the usual "Speed Reading" courses emphasizing more rapid seeing wouldn't answer our problems. While it is true that good reading involves good seeing, it also involves good thinking. *It isn't necessary that our workers read at the 8000 words per minute that has been recently reported in the press; it is necessary that they read with excellent comprehension.* All the recent research in this field has shown that increased visual skill resulting from the usual course of flashmeter training is not necessarily accompanied by greater speed in the comprehension of difficult technical material, although it may be of value in the reading of simple material requiring mere recognition.

Mr. Ranney is Chief of the Special Instruction Section of SCEL. Having many years' experience in the educational field, serving as teacher, principal and supervisor of schools, he was also Assistant Director of the New York University Reading Institute and consultant on reading for many large corporations, including the New York Life Insurance Co., Atlantic Refining Co. and IBM.

We decided on a different approach, one followed in some of the universities. We made use of the flashmeter, Harvard Films, and other training aids, but only to enable us to control the reading situation in class. Our major emphasis was on a study of the *logical organization* of written material. We hoped to develop in our students the ability to pick out the important points, to outline mentally, and to grasp the author's thought instead of merely remembering the words used. This approach based on the philosophy of Dr. Stella S. Center (a pioneer in this field) that "good reading is disciplined thinking."

At the same time, we kept increasing the speed of selections used. As a matter of fact, comprehension and speed go together, but only if comprehension comes first. The very slow reader is likely to have poor comprehension. He gets so bogged down in detail that he never sees the over-all picture. He thinks, as Clifton Fadiman has said of most readers, that every word is golden.

One of our hardest tasks was to develop flexibility. Most of our students were reading the sports section of the paper with the same attention that they devoted to a research report. They had formed the habit of reading word-for-word.

Most of our reading exercises were prepared from materials read by our students on the job—reports, memoranda, correspondence. All exercises were followed by questions and discussion.

We knew that if the students were to retain for habitual outside use the skills learned in a controlled classroom situation, transition would have to be provided. Hence, we gradually introduced the reading of selections at the student's own speed, but with a record kept of the speed. They slipped back at first, but then picked up again, some reading faster than we had expected (but none at 8000 words per minute).

The course proved to be difficult, both for teacher and student. Old habits are hard to break, and many students found the experience frustrating. They did stick, though, and seemed to get over the hump after a while. Once they adjusted themselves to the new approach, speed picked up rapidly and so did comprehension. We found that we needed twenty weekly two-hour sessions to accomplish what we wanted.

To measure progress, we used different forms of the American Council on Education's objective tests given at the beginning of the course. The average student went up about 25 percentile points — he was able to read successfully about 40 per cent more material in a given time after training than he could before. We never score our students' skill in terms of words read per minute. We think that this speed is not significant unless such factors are considered as the difficulty of the material, the students' familiarity and need for it, and the degree of comprehension.

Training Pays Off

About 500 employees, civilian and military, have received this training. Although present shortage of staff requires us to limit the training to off-duty hours, interest is just as great as ever. Perhaps this is because the training does seem to pay off. A recent survey shows that the average graduate feels that he has saved about an hour a day out of the three that he formerly devoted to reading. He says that getting through the in-basket more rapidly gives him more time for the creative part of his job. He says also that he doesn't seem to miss the point of his reading now.

One of the most interesting outcomes of the reading course was the interest aroused in writing. A discussion of paragraph patterns would frequently be followed by the complaint that much of what the students themselves wrote, and much of what they saw on the job, didn't seem to follow the rules for logical structure. They became conscious of their own faults and asked for training.

This was a natural step, and one perhaps even more important than reading training. Even the good reader is slowed down by poor writing, and sometimes he takes a meaning that wasn't intended. Writing is an every-day task for Captain Smith, who writes during his Army career thousands of official letters, memoranda, and staff reports. If he writes clearly, simply, and effectively, he benefits, and so does the Army. Many officers don't, and hence dread this unavoidable part of their work. It is necessary, though, and the officer should learn to do it well.

We have in the Laboratories a similar writing problem, one that is shared by every other research organization. Professor Joseph N. Ulman of MIT says (in emphasizing the importance of clear report writing), ". . . some engineering and scientific organizations do nothing but investigation, testing, experimentations, or research. Their tangible product is the report. If they are to have anything to show for their efforts, they must do a thorough job of reporting."

Although our function is not this limited, reporting is a major part of our work. In 1953 some 111 formal reports of investigations were made and circulated to all concerned branches of the Armed Forces. We also turned out many periodic progress reports. Some individual branches turn out many smaller reports. For example, the Suppression and General Engineering Branch sends out every month 50 or 60 reports of investigations requested by military users of radio equipment. Staff members published in scientific and technical journals 42 professional papers. If output is any measure, the ability to produce well-written reports is of the greatest importance to us.

Since many of the engineers have as their prime function the supervision of work of outside contractors. correspondence is voluminous. We have also the usual load of inter-office correspondence, memoranda, etc., that might be expected in any organization of 4000 workers.

CSigO Lends Support

In the spring of 1953, with the approval of the Chief Signal Officer, Major General George I. Back, we set up a pilot program in effective writing for project engineers. We weren't interested in literary style — we were guided by a memorandum of General Back on Staff Writing, in which he emphasizes accuracy, brevity, clarity, coherence, emphasis, unity and simplicity.

We weren't able to measure present skills in writing as accurately as we had been able to in reading. The most important skills are intangible and, hence, hard to measure objectively. We did use the Barrett-Ryan-Schrammel Test to measure knowledge of sentence structure and diction, punctuation, and grammatical form. We knew that these skills were a necessary prerequisite to training in logical organization in writing. Results of the testing showed clearly that earlier instruction in these topics simply hadn't taken, and that instruction in fundamentals would have to be a part of our course.

Our first class included 19 project engineers, and met for 17 two-hour sessions. We spent the first third of the course on a review of the *mechanics of language*. Here we took up only those rules which affect meaning, and we used for practice examples taken from our own materials. The engineers were impressed by the changes in meaning resulting from a misplaced comma. They all felt that they needed more time on this section.

Basic Grammar Studied

The second part of the course reflected our chief concern in the whole program — the requirement for *logical structure* in our writing. We reworked sentences for proper order of sentence elements, parallelism, correct subordination, etc. Our treatment of the paragraph was based on the syllogism, as was that of the three-paragraph unit and the longer exercises.

We worked hard to achieve good topic sentences and good endings. We weren't concerned about style, but we did teach a proper approach in presenting ideas — from familiar to unfamiliar, from simple to difficult, the use of time sequence, and other long-accepted basic principles. In all of this study we made free use of reports, memoranda, and correspondence originating in the Laboratories or coming in. Our students were good sports about this, although there were some red faces in the class at some of the students' comments.

As was the case with the section on mechanics, we had to leave this part too soon. Nevertheless, it was very important to devote time to the crying problems of *readability and simplicity*. Here we borrowed freely from the precepts of Rudolph Flesch and Robert Gunning, workers in this field with businessmen. Of course, not all the rules of simple writing apply to official correspondence. We were able, though, to convince our students that the use of the third person does not require the use of passive verbs or of absurd circumlocutions or the use of abstract instead of base words. Some of the students hesitated to discard the cliches they had been living with for so long, but we were fortified by General Back's memorandum. His espousal of our basic principles stiffened their spines.

As a matter of fact, the standard complaint of our students was, "They won't let me write it this way." We always found out when we investigated that "they" were very anxious for simple, readable writing.

"They" seemed quite pleased with the results, too, when it came time to measure the results on the job. We had been able to measure improvement in the mechanics at the close of the course. The average student went up from the 15th to the 62nd percentile. We knew, however, that the other, more important skills would have to be based on the student's own opinion and on that of his supervisor. A study made six months later showed that the average student felt that he had saved .95 hours a day of the 3¼ hours formerly devoted to writing. Supervisors' questionnaires revealed savings of perhaps even greater importance. They pointed out savings in supervisor time formerly devoted to re-writing, and in typists' time used for unnecessary drafts. They emphasized also the improvement in the end-product, and the better understanding all along the line.

Program Continues

As a result of the success of the Pilot Course, the program has been continued. Six classes of 25 each were taught last year, and three are in session now. These have been general in nature, with application to all sorts of the writing that we do.

We just completed a special course for a group of correspondents whose sole function was to investigate complaints and inquiries from the field. Sometimes their work was wasted because their letters weren't clear. Quality has improved and the letters go out faster than before. This is not a new idea, of course. The New York Life Insurance Company has had a continuing training program for their correspondents for years, and finds that it pays. They are interested also in the public relations value of a good letter. So is the Army.

We hope to take up other special problems when we can. In the meantime, we have requests for writing training for more than a thousand other civilians and officers in the Laboratories, and have received requests for quotas from other agencies at Fort Monmouth.

The recognition of the need for better communication seems general. It isn't limited to the Services either. The Robert Gunning referred to earlier has done the same sort of job for 84 corporations, including such giants as Standard Oil and the Baltimore and Ohio Railroad.

I am not sure why these courses have been more effective than the earlier English composition courses that all of our students took in college. Perhaps it is because the motivation that the students lack in college is high in the man who has learned on the job the importance of good writing. Probably too, the functional aspect of the course, the reality of the exercises that he writes, plays its part. The students' extra maturity must also help.

To me the most satisfactory outcome of this training is the students' more logical thinking. This should not be astonishing. Long ago Roget (of the famous Thesaurus) referred to the "immense influence that is exercised by language in promoting the development of our ideas. . . ."

The man who has learned in his reading to cut through the underbrush to the core of meaning and to weigh this core critically; the man who has learned in his writing to eliminate the unnecessary or irrelevant words and to support his points directly and convincingly; seems also to improve similarly in his thinking.

Self-Regulation

a message to • manufacturers
• dealers
• users of radio equipment

from FCC Commissioner Edward M. Webster

IN THIS DYNAMIC COUNTRY OF OURS, WHERE MAN'S ingenuity is given the utmost freedom and encouragement, innovations crowd closely on the heels of innovations, opening the door to newcomers in old enterprises and giving rise to new business interests; thereby, rapidly creating new conflicts of interests, or aggravating old ones.

In no business enterprise is this more true than in the field of radio, the use of which is growing so rapidly that the Federal Communications Commission no longer has the manpower to regulate it as efficiently as in the past. As a matter of fact I doubt that an increase in manpower is the answer to this growing problem, for I question whether we could continually add the manpower which this expanding industry would demand. And, while I know there has always been a hue and cry raised against government regulations in general, and against the regulatory powers exercised by the Commission in particular, this statement of mind should give pleasure to no one, for *without adequate regulation*, and in the face of the rapidly growing use of radio, I envisage a chaotic radio utilization situation in this country in a relatively short time. Anyone giving any thought to the future course of industrial radio must realize this. But for some factual indication of what is coming to pass, let us glance briefly at the picture of yesteryear and today.

In the early days of radio after 1927 the problems of regulation and enforcement were comparatively simple, for the number of authorized radio services, prior to World War II, was limited and the number of licensed stations far less than at present. Accordingly, the Commission, through the medium of its written Rules and Standards and its enforcement staff, was, for the most part, able to discharge its statutory duty to regulate radiocommunications.

However, far different conditions prevail today. Eligibility requirements have been liberalized in many services, and, through the extension of the upper limit of usable frequencies from a practical limit of about 40 megacycles in 1940 to 30 thousand megacycles today, many new services have been added. As a result we now have approximately 146,000 licensed radio stations, other than broadcast and amateur authorizations, as compared with approximately 10,000 in 1940. On the basis of today's authorizations there are in the neighborhood of 600,000 transmitters in use on a fairly regular basis in services other than broadcast and amateur. With all services included, the figure rises to at least 800,000 transmitters in operation.

It requires no stretch of the imagination to predict that if the use of radio continues to expand at its present rate, *the number of transmitters which will come into use in a relatively few years will exceed one million in number*. With the advent of the short-distance range stations operating in and above the VHF band, monitoring of the vast number of stations which already exist have been precluded and the regular inspection of all stations now licensed would require an inspection staff beyond all reason. Therefore, in the light of the situation which presently confronts the Commission, and in view of the tide of new radio uses which cannot and should not be turned back, I foresee a condition of congestion and interference in the industrial radio field if steps are not taken at this time to ward off this eventuality.

While the Commission cannot and will not shirk its regulatory duties, it is obvious to any farsighted person that, in the furtherance of their own interests, users must step into the breach and cooperate among themselves and with the government in order to maintain a proper household. In other words, *industry must help to shoulder the burden, and, through the process of self-regulation achieve efficient and orderly communications.*

Cooperation Necessary for Achievement

Now, I do not contend that the task of self-regulation is an easy one, nor do I pretend to have the final answer as to how it should be done. But, gentlemen, if we are to head off the problems which I foresee in this field there must be a measure of self-regulation, and this can only be accomplished through cooperation of the highest order. Not only cooperation between government and industry, but between industrial groups. And not just between

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This is the major portion of an address delivered by Commissioner Webster at the January meeting of the AFCEA New York Chapter.

users of radio, for, without the help and cooperation of the equipment manufacturer, industry could conceivably find itself walking a treadmill in its efforts to regulate itself. Accordingly, in addressing myself to the subject of self-regulation as I propose to do here, I shall endeavor to point out certain cooperative efforts which can be made on the part of the manufacturer as well as the dealer and the user of radio equipment.

Although the Commission has issued a notice of proposed rule making which, among other things, includes limits on receiver oscillator radiation, it has never published rules or standards regarding the design and operation of receivers. Thus, radio equipment manufacturers, while bound by rules and standards governing transmitters, have not been required in the past to meet any particular standards pertaining to receiver designs.

While there will always be equipment problems to be met as the radio art advances and new uses therefor come into being; nevertheless, there exists numerous shortcomings in current equipment which can be corrected at this time. Receivers can be designed to provide improved selectivity, fewer spurious responses, and less radiation. At the same time transmitters can be made to operate well within the current frequency tolerances so as to permit a future tightening of tolerances without causing equipment obsolescence; spurious and harmonic emissions can be reduced to the lowest practicable level; equipment for the land mobile services can be made capable of narrow band operation; the range of voice modulating frequencies in radiotelephone equipment can be limited to those necessary for intelligible communications; and means can be provided for the prevention of over-modulation with its consequent interference. And what *can* be done *should* be done, for equipment designed with these improvements in mind lends itself to the continued exploitation of the spectrum with a minimum of economic loss through obsolence.

* * *

There is still another step the manufacturer can take in order to facilitate self-regulation, and this should be made in conjunction with the dealer who distributes the manufacturer's equipment. They should keep in mind the fact that in many instances they are selling to persons who are dealing with radio for the first time; who know nothing about their equipment needs; and who rely almost entirely upon the manufacturer or dealer for advice in this connection. After all, to those purchasers radio is merely a tool. Accordingly, before selling the equipment the manufacturer and/or the dealer should ascertain whether the prospective purchaser is eligible under the Commission's Rules to hold the authorization he seeks and, if so, point out the limitations imposed by the rules upon the equipment's use. Continuing in this vein, the manufacturer or dealer should impress the purchaser with the importance of familiarizing himself with the rules and standards pertaining to the service in which he proposes to operate.

Turning now to the user we note that the Communications Act sets forth various statutory violations for which a station license may be revoked, included among which is the willful or repeated failure to observe any provision of the Act, or any rule or regulation of the Commission. Accordingly, the licensee is obviously required to be familiar with those provisions of the Act and the Commission's Rules which govern the service in which he operates.

But, despite this requirement, it has been the Commission's experience that only a small number of radio users take the time and the trouble to familiarize themselves with pertinent provisions of the Act and rules. At least, when called to account for their sins, they attempt to extricate themselves from an untenable position by pleading ignorance of the law. And, amazingly enough, they continue, in many instances, to resist regulation, either because it suits their convenience or their pocketbook, or because they believe the Commission will not adopt stringent measures against them, if and when they are caught.

Majority Must Check the Minority

Now, I realize that a majority of the people, regardless of race, creed or color, are for the most part, decent, law-abiding citizens. But, there is always a sizeable minority of the public, consisting of individuals who have no consideration for their fellowman, whether they are driving a car or using a part of the public domain, who make it difficult for everyone with whom they come in contact. Narrowing this to the field of telecommunications—it is this segment of radio users which needs policing and discipline. And only firm action by a majority can sold this minority in check.

Therefore, in my estimation *the key to successful self-regulation lies in the hands of the station licensees whom I have chosen here to call the users.* For, while the equipment manufacturers and dealers can make worthwhile contributions, in the final analysis the cooperation of the equipment users is the touchstone of self-regulation. Now, what I am about to suggest here is not a radical departure from the regulatory procedure already in existence, for the Commission must and will continue to establish rules and standards governing the use of radio and, to the extent possible, enforce observance thereof. But, in addition to this I am calling upon all users of radio throughout the country to recognize the fact *that they have an obligation to themselves as well as the public to assume, by self-regulation, greater responsibility for adhering to the Commission's Rules and Standards.*

One step in this direction is to form user groups along functional lines whose purpose it is to educate the user in the proper utilization of his equipment and familiarize him with the provisions of the Act and rules which govern the service in which he operates. Whether this should be done through regular meetings or through written instructions can be determined best by experience.

Another step would be to have this group, or another one set up for the express purpose, serve as an investigator and monitor to determine whether the user is operating in conformance with the rules and standards and to direct his attention to such infractions thereof as may be patent. Persistent violations should be reported to the Commission, whose duty it would be to determine the action which should be taken to insure, to the extent possible, that the violations will not be repeated.

As still another step, which can only be done on an individual licensee basis, the user must assume a greater responsibility for the conduct of his radio operators. In earlier years, when operators with a greater technical proficiency were needed because of the equipment then in use, operator licenses were issued only after an applicant had, through written examination, demonstrated his familiarity with the Commission's Rules and Standards and the technical operation of radio equipment. As a result, radio stations were manned by skilled radio operators. But, because much modern equipment is of the "pushbutton" type, operators in the land mobile services are no longer required to be technicions, and a restricted radiotelephone operator's permit can be obtained without examination. While such operators are expected to famil-

(*Continued on page 77, col. 1*)

EVERY COPY AN ORIGINAL

Air Associates, widely known as a manufacturer of electronic components, has now added facsimile equipment to its list of products.

by Robert J. Pike

FACSIMILE COMMUNICATION EQUIPMENT recently developed by Air Associates, Inc., will go a long way toward providing much-needed relief to businesses with bad cases of paperwork sclerosis, an occupational disease so named recently by a leading sales publication.

American business spends millions of dollars a year moving tons of important paperwork of all kinds from place to place. It employs thousands of systems and procedures experts to keep sluggish data flow moving. A deterrant to—and often a penalty for—a successful operation, the paper communications disease usually grows as a business grows.

Saturated with hidden costs, this business headache has become a fabulously expensive operation. Perhaps more devasting to business afflicted with a bogged-down paper-communications system is the resultant time delay in decision-making for lack of data. These costs cannot be definitely ascertained.

"Electronic Messenger"

Incorporating several past scientific achievements in an unusually simplified, over-all design, Air Associates' new facsimile equipment, the "Electronic Messenger" augurs as one remedy that will substantially alleviate business' paper-conveyance problems. That company is currently producing an initial production run of commercial facsimile transceivers, making available to business and industry a simplified system for rapid transmission for any printed or written matter between offices, plant, or stations over wire or microwave circuits.

Designed as a two-way single unit package, the Electronic Messenger transmits exact, permanent copies of any printed or written original (including graphs, maps, drawings, sales orders, vouchers, galley proofs) in any shape and size up to 8½" x 14". Companion machines, located at various points, receive the transmitted data and produce an authentic copy of the original. The unit weighs less than one-hundred pounds and is only slightly larger than a typewriter.

100 Lines Per Inch Rate of Photo-Cell

Designed especially for operation simplicity, no special skill is required to operate the machine. Data to be transmitted is merely placed on the scanning drum and the "transmit" button pressed to begin transmission. The machine produces a "monitor" copy at source.

Essentially the heart of the fascimile equipment is a photo-cell. The photo-cell "looks" at the data to be transmitted at the rate of 100 lines to the inch and converts what it sees into electric impulses. These are amplified and transmitted over wire or microwave circuits to one or more companion machines at various locations. Here the electrical impulses are passed through chemically treated paper to produce the original data.

Considering the simplicity of this new equipment, the dire need of it in many aspects of business, and the contributions it can make to world culture, one may wonder why in all these years, facsimile is not in widespread use.

Progress Slow

Since the issuance of the first patent for a facsimile process in 1848, "facsimile" consistently lacked the glamour of its communication contemporaries, the telegraph and the telephone. During the early stages of facsimile development, a great need for the rapid transmission of the written record was not evidenced. Hence, substantial technical and financial efforts were channeled toward the construction of lines for telegraph and telephone use. Facsimile, like a stepchild, was shunted aside and remained neglected until the early 1900's.

From that time until the present, a number of inventions materialized to contribute toward the ultimate development of "commercial fascimile." Over the years, major technical problems were gradually solved, but little industrial interest was shown. However, scientific advances in the electronics art under war-time government sponsorship contributed substantially to improve the concept of

"The Electronic Messenger"— new facsimile transceiver now being produced at Air Associates' plant in Orange, New Jersey.

facsimile equipment applications.

But once again industrial facsimile progress suffered a minor setback. This time, television—a cousin of facsimile—was responsible. With the end of the war many electronic manufacturers who might have considered undertaking production of facsimile equipment with their excess facilities, quickly made bids for the lush television market.

While television was becoming accepted as a commonplace furnishing in the American home, the progress of business placed ever-increasing importance on paper work, correspondence, and original documentation; the need for facsimile became more acute than ever.

Uses Innumerable

The possible applications for the Electronic Messenger are numerous and those in the partial listing below were compiled from statements by business and industrial people who have expressed keen interest in this time-saving device.

Banks—Verification of signatures and credit ratings.

Wholesale, Retail—Processing customers' orders; ordering movement of stocks from warehouse to store.

Automotive industry—Transfer of vital data from mass-production assembly line to production-recording office.

Airlines—Transmission of airline ticket sales data from city office to airport passenger agent.

Utilities—Speed-up of emergency work-order processing; up-to-the minute central control of far-flung independent operations.

Publishing—Transmission of editorial copy and layout from composing room to publisher's office for last-minute check.

Railroads—Train scheduling, between control points and central scheduling office.

Pipelines—Transmission to central regulating control office of customer-consumption reports.

Microwave Facsimile

The impact of facsimile transmission on established cultural patterns in society will have far-reaching effects, extending even to the remotest sections of the world. Microwave facsimile messages can be sent to the most primitive and isolated areas where wire communication does not exist.

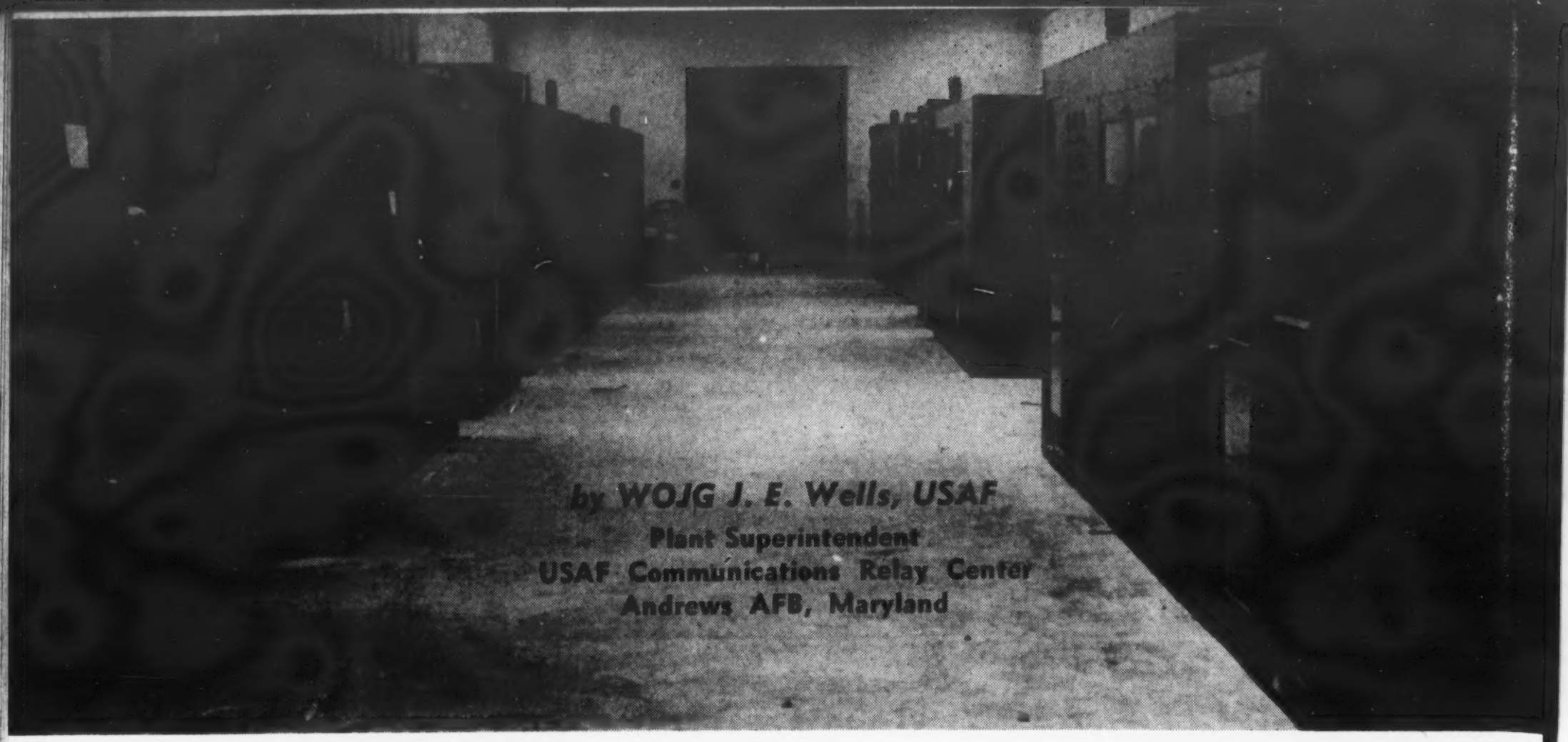
Especially in countries where communications are primitive and language problems acute, can the Electronic Messenger bring centuries of progress overnight. Consider the case of the Chinese. In transmitting copy for one edition of a newspaper in China, ten Chinese are required at the transmitting end to convert the characters into cipher code which can be transmitted by morse or printing telegraph. Ten more are required at the receiving end to convert the code back to Chinese. This time-consuming burden would be eliminated with the use of facsimile equipment.

Air Associates' Divisions

A pioneer in electronics, Air Associates, Inc., has designed and manufactured a host of different types of electronic equipment for military and commercial uses, including radio ranges, special-purpose receivers and transmitters, aircraft intercommunications systems, firing-error indicators, and underwater (Sonar) telephony systems. Current work involves further development in communication and navigation equipment, remote control systems, and special miniaturized devices.

Besides the Facsimile Equipment Division in Orange, New Jersey, Air Associates also designs and produces electro-mechanical pneumatic, and hydraulic devices and systems for aircraft, missiles, and allied applications at its Aircraft Products Division in Teterboro, New Jersey.

The company's Supplies Division maintains a nationwide network of sales and service branches through which it sells over two-thousand different types of essential aviation supplies and equipment to all segments of the aviation industry.



by WOJG J. E. Wells, USAF
Plant Superintendent
USAF Communications Relay Center
Andrews AFB, Maryland

These high powered transmitters provide the capability for transmitting messages any place in the world.

Communication Maint

AFTER WORLD WAR II WHEN THE US Air Force became an independent service, it inherited the responsibility for establishing facilities to handle all USAF communication traffic. This existing requirement, augmented by increased pressure during the post war years for an expanded Air Force, necessitated an immediate expansion of USAF communication facilities. Planning to meet this requirement resulted in a series of radio stations, simulating a belt around the world, appropriately referred to as the "Beltline." The program which implemented the activation of these stations was referred to as "GLOBECOM."

The USAF Global Communications System is comprised of the Beltline stations plus other stations which are connected to one or more of the Beltline stations. The Beltline stations comprise basically the trunk system for the overall integrated USAF world-wide communications system.

The first of the Beltline stations was placed in partial operation at Andrews Air Force Base near Washington, D. C. This is one of the two Gateway Stations to the world, each of which is located at opposite sea coasts in the United States. Naturally, such a system is inherently complex. After it has been conceived, engineered, installed and tested it must be adequately *maintained* with the best system practices available.

From a purely maintenance standpoint the station at Andrews is comprised of four separate facilities; the Relay Center; Technical Control; a Remote Receiver Station, and a Remote Transmitter Station. The two remote plants are tied together through technical control to the relay center facilities by means of radio links supported by landline facilities.

Procedures by Trial

Since the facility at Andrews was the prototype of the Beltline stations, there was no precedent for determining all of the maintenance problems and requirements to be expected. There were no set standards of maintenance procedures to be followed, either for the individual types of equipment when installed as a unit or when combined in a system. Therefore it was necessary that adequate maintenance procedures be locally established by the operating personnel on a trial basis.

These procedures were initially based on a combination of experiences gained from installing and testing the equipment at Andrews, from manufacturer's specifications and recommendations and the varied and extensive background of any and all maintenance personnel assigned to man the facility. In some cases standard operating procedures were based on actual experience gained after the station was placed in operation. Needless to say, as the operational capabilities were expanded and more operating experience was acquired, many of the procedures proved either inadequate or too demanding.

The original programming of the system facilities established that maintenance functions should be divided into four major subdivisions with more or less equal autonomy. An assistant maintenance officer was placed in charge of each of these sub-divisions, and the basic structure, as originally devised, has been maintained throughout most of the station's history.

The one deviation from this concept was that the technical control facility was made an integral portion of the maintenance section, rather than be under the administrative jurisdiction of the staff operations officer. Even though the actual job responsibilities and types of personnel manning the control section have

The maintenance of a world-wide communication system depends upon correct procedures, efficient planning and trained personnel. Setting up a workable program for the new equipment at Andrews AFB GLOBECOM station required ingenuity to overcome problems.

nenance for the Beltline

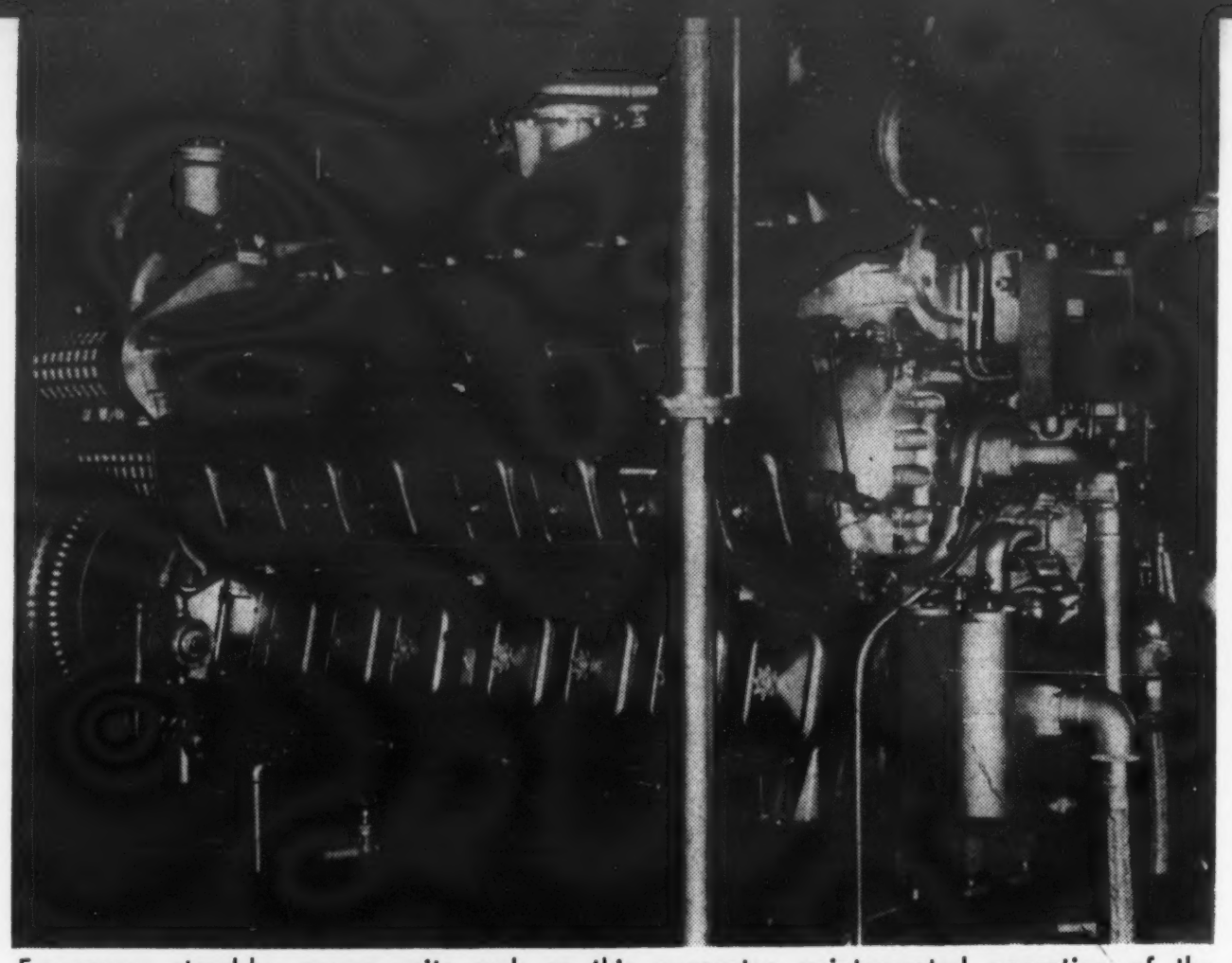
remained unchanged, numerous advantages of coordination from a maintenance standpoint have been realized as a result of this change in administrative control.

One of the first problems to be solved during the operation of the new Gateway station was the elimination of difficulties in coordinating circuit failures among operating personnel, technical control, and maintenance personnel. Since the heart of the station is the Western Union Plan 51.3A semi-automatic teletype switching center, it was recognized that the majority of circuit failures would be detected first by switching center personnel in the operations aisle, because only a small portion of the total circuits could be monitored at any one time by technical control personnel.

A standing operating procedure was published which outlined in detail the procedures to be followed when circuit difficulties were encountered. The first step in this procedure was the notification to Technical Control by the most expeditious means available of the difficulty encountered. At this point it became the controller's primary responsibility to determine the actual cause for circuit failure. Both the input and output circuits of each individual item of equipment installed in the Relay Center are terminated on the tech control patch panel. By means of a series of patches, tests, and a process of elimination, the controller is quickly able to determine whether the trouble is due to "in-station" equipment failure and which item of equipment is responsible, or due to an "external reason." External reason could mean trouble with the equipment at the distant station, radio wave propagation difficulties, or trouble at the remote receiver or transmitting stations.

If the trouble is determined to be caused by a failure of some item of "in-station" equipment, the controller patches in a spare, like item of

All circuits terminate in the Technical Control. These patch panels provide the flexibility required to properly utilize and test all items of equipment in the Relay Center.



Emergency stand-by power units such as this guarantee uninterrupted operation of the system in case of failure in the primary power source.

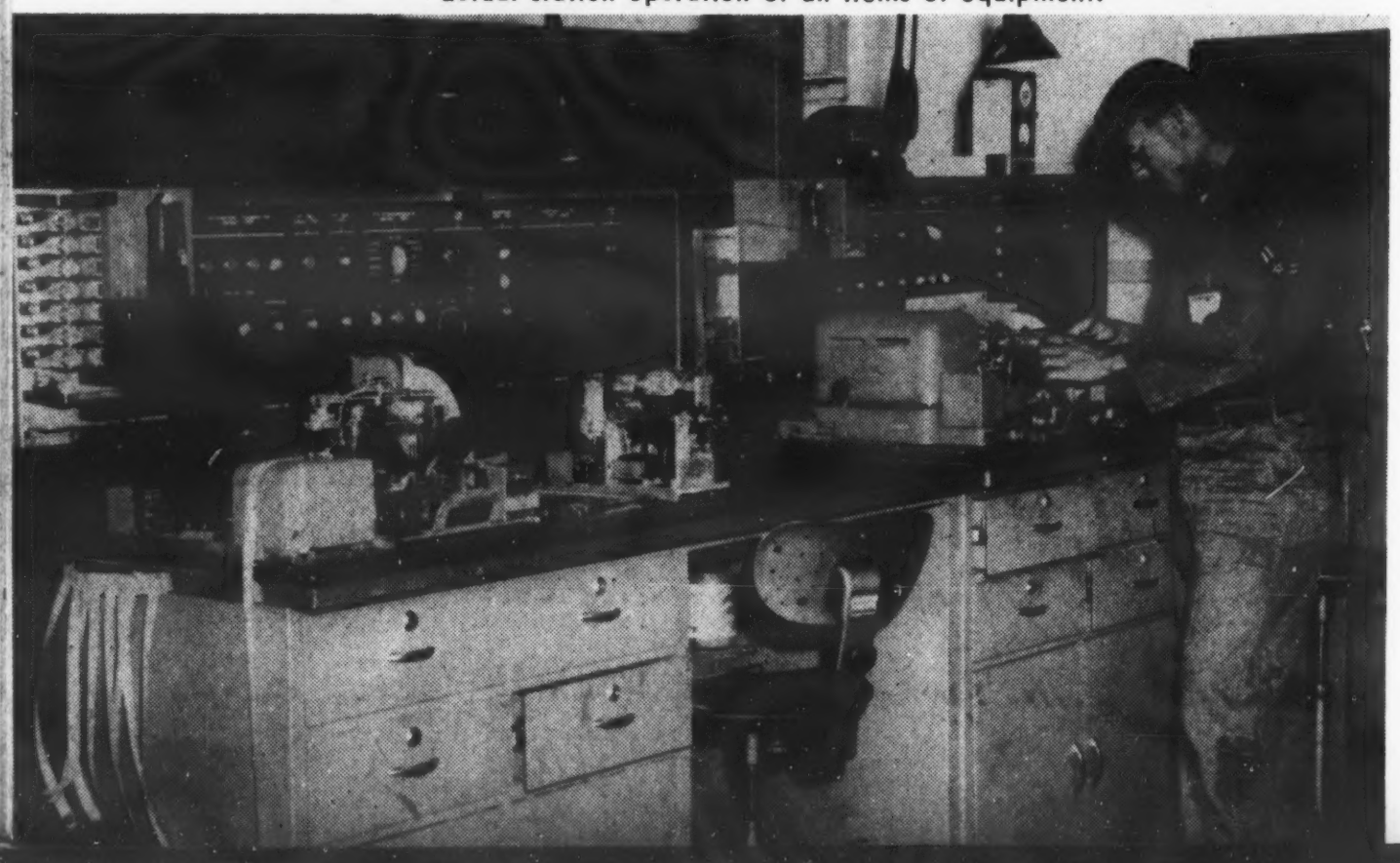
equipment to restore the circuit to operation. The controller then fills out a trouble ticket form and carries it to the flight supervisor responsible for maintenance of the particular item of equipment. The data entered on this trouble ticket includes the time the ticket was filed and, if possible, symptomatic indications of the failure. The flight supervisor receiving the ticket receipts for it and in turn assigns the job of checking and repairing the equipment to one of his maintenance technicians. When the technician has returned the equipment to normal operation he reports to his supervisor, and a detailed description of corrective action taken is entered on a work order form and the equipment maintenance record forms after which the trouble ticket is returned to Technical Control. The controller then runs a thorough systems check on the circuit. If it checks satisfactorily, he signs an acceptance of the completed trouble ticket, notes the time of acceptance, and returns the circuit to "normal through" operation. The completed ticket is then placed on record for future reference and analysis.

Excepting propagation difficulties, if the tech controller has established the circuit failure as due to "out-of-station" reasons, he contacts the remote receiver or transmitter station by order wire. A brief analysis of the difficulty is passed on to the maintenance supervisor of the remote station and the time of failure logged by both individuals concerned. The same maintenance procedure followed in the Relay Center is then carried out. Upon completion of the check or repair of the equipment, the remote station contacts the control by order wire reporting the equipment back in normal operation and stating the reason for the failure. After circuit quality checks have been made, the controller accepts the circuit for traffic, and again both parties enter the time of acceptance and reasons for the outage on their trouble reports.

If the trouble is determined to be beyond the remote facility, the maintenance supervisor notifies the tech controller as soon as possible and he contacts the distant end station for further coordination.

In case there is a failure of some component of the microwave intersite links between the relay center and the remote facilities, a slightly different technique of coordination is necessary. Owing to the electrical characteristics of the microwave equipments utilized, it is not feasible to terminate them at the patch panel in such a manner as to permit monitor by the technical controllers. However, they are terminated to the extent that any multiplex terminal may be patched to any transceiver. Thus, when trouble exists on one of these systems, traffic is patched to an alternate system and trouble tickets are issued as outlined for "in-station" equipment failures. It then becomes the responsibility of the maintainer in the Relay Center to effect the coordination necessary at both terminals and to isolate the trouble and restore the circuit to normal operation.

The plan 51.3A semi-automatic teletype switching center is the "heart" of the USAF communications relay center at Andrews AFB. This test bench permits the maintainer to simulate actual station operation of all items of equipment.



Preventive Maintenance Vital

So far only that phase of maintenance which is regarded as "special" or unscheduled maintenance has been discussed. The greater portion of the maintenance program is centered around a scheduled or preventive maintenance routine. It was evident from the outset of the operation that the preventive maintenance schedule must be as streamlined as possible and still be effective. Naturally, conformance with established maintenance procedures as defined by military regulations was necessary. However, since much of the equipment was new to the Air Force for systems use, considerable leeway was granted to the operating organization in fixing upon an adequate preventive maintenance program.

In the majority of cases manufacturer's recommendations and publications guided maintenance planning. In a few instances, USAF technical orders, which outlined the procedures to be followed, were complied with. Of necessity, the program was initiated on a trial basis, based upon the background experience of maintenance personnel assigned to

(*Continued on page 76, col. 1*)

First Navy Jack, which unfurled the historic warning to the world in 1775—believed to have been first hoisted to the jackstaff of the ALFRED by one Lieut. John Paul Jones.

naval history is being made today

At 0955 on January 5th, one of the major events in naval aviation history took place.

It was the unveiling of the United States Navy's great new XP6M SeaMaster—Ship No. 1 and prototype of an entirely new concept in military aircraft.

As a component of a powerful new arm of the naval arsenal—the Seaplane Striking Force—the Martin SeaMaster focuses national attention upon a revolutionary principle of military strategy, known as the WBA* concept. Here's why:

The SeaMaster is a highly versatile 4-jet waterbased aircraft, in the over 600 MPH class, which requires no fixed base and can operate from the seas, lakes and rivers, the coastal bays, lagoons and estuaries of the world... bases unlimited!

Today the top-level talk is turning to WBA... and shown here is the reason.

*WaterBased Aircraft

MARTIN

BALTIMORE : MARYLAND

From the President

President Bailey Introduces Our National Directors

The Armed Forces Communications and Electronics Association is fortunate in having an outstanding and nationally important group of business, industrial and service leaders on its Board of Directors. These directors appear only as names in our magazine, SIGNAL, and on the AFCEA membership invitation. I believe it is proper that I bring to the attention of our large and growing membership the business and service affiliations of our Board.

Rear Adm. WILLIAM B. AMMON, USN, Washington, D. C. Director, Naval Communications.

HARRY E. AUSTIN, San Francisco. Vice President in charge of Pacific Coast District, RCA Communications, Inc.

Maj. Gen. GEORGE I. BACK, USA, Washington, D. C. Chief Signal Officer, United States Army.

VERNON B. BAGNALL, New York. Project Manager, Defense Projects Division, Western Electric Company; Colonel, USAR.

GEORGE W. BAILEY, New York. Executive Secretary, Institute of Radio Engineers.

Dr. W. R. G. BAKER, Syracuse. Vice President, Electronics Division, General Electric Company; Treasurer, Institute of Radio Engineers.

THEODORE L. BARTLETT, New York. Aviation Frequency Bureau, Radio Corporation of America; Colonel, USAFR.

PERCY G. BLACK, Washington, D. C. Assistant Vice President, Automatic Electric Company; Vice President, Gary Services and Investment Company; Colonel, USA Ret.

Maj. Gen. GORDON A. BLAKE, USAF, Washington, D. C. Director of Communications, United States Air Force.

ROLAND C. DAVIES, Washington, D. C. Publisher and Editor, *Telecommunications Reports.*

HARRY A. EHLE, Philadelphia. Vice President, International Resistance Company.

E. K. FOSTER, Towson, Maryland. Vice President, Bendix Aviation Corporation; General Manager, Bendix Radio Division.

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THOMAS F. HALLORAN, Lawrence, Mass. Executive Director, Greater Lawrence Citizens' Committee for Industrial Development; Rear Admiral, USN Ret.

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WILLIAM V. KAHLER, Chicago. President, Illinois Bell Telephone Company.

F. R. KAPPEL, New York. President, Western Electric Company.

J. HARRY LABRUM, Philadelphia. Managing partner, law firm of Conlen, LaBrum and Beechwood; Brigadier General, USAR.

FREDERICK R. LACK, New York. Director, and Vice President in charge of Radio Division, Western Electric Company,

DONALD F. MCCLURE, New York. Assistant Vice President in charge of personnel, New York Telephone Company.

FRED E. MORAN, Boston. Superintendent, Western Union Telegraph Company, Boston, Mass.

LESLIE F. MUTER, Chicago. President, The Muter Company; Treasurer, Radio-Electronics-Television Manufacturers Association.

JOSEPH R. REDMAN, Washington, D. C. Consultant to Western Union Telegraph Company; Rear Admiral, USN Ret.

DAVID SARNOFF, New York. Chairman of the Board, Radio Corporation of America; Brigadier General, USAR Ret.

ROBERT C. SPRAGUE, North Adams, Mass. Founder and Chairman of the Board, Sprague Electric Company.

ELLERY W. STONE, New York. President, American Cable & Radio Corporation; Rear Admiral, USNR.

W. WALTER WATTS, New York. Executive Vice President in charge of Electronics Products Division, Radio Corporation of America; Colonel, USAR.

FRED J. TURNER, Atlanta. President, Southern Bell Telephone & Telegraph Company.

JOHN A. WHITTLE, Rochester, N. Y. Manager, Contract Sales Division, Eastman Kodak Company.

FRANK W. WOZENCRAFT, Washington, D. C. Washington attorney, and legal counsel for AFCEA; Colonel, USAR Ret.

AFCEA owes a debt of gratitude to our directors for their advice and counsel.

George W. Bailey

THE IMAGINATION FOR RESEARCH + THE SKILL FOR PRODUCTION

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. . . welded into one close knit organization of integrated responsibility. From the first step in research to the first production unit, the same engineering group is responsible for both design and development. This integrated operation eliminates diversion between early development and final responsibility for maximum production design. One group of specialists with one goal . . . the solution to your problem.

For the past ten years Hoffman Laboratories has been successfully solving advanced design and production problems in electronics and electro-mechanics. In almost every case it has been necessary to reach beyond the routine of development . . . to develop special test and analytic equipment . . . to formulate unique research procedures.

Hoffman Laboratories has never undertaken a development project that has not gone into production.

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Interior view of Sound Chamber. Hoffman Laboratories has one of the West's largest and best equipped Environmental Test Laboratories.

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Association Affairs

CONVENTION REGISTRATION FORMS MAILED FROM HEADQUARTERS

The first reservation and registration forms for the 9th Annual AFCEA Convention, May 19, 20 and 21, were mailed from National Headquarters on March 1st to all members of the Association.

At the same time, Convention Chairman Benjamin H. Oliver, Jr. announced that the program now includes a special tour of the United Nations Building on the afternoon of Friday, the 20th. Bus transportation to and from the Hotel Commodore, Convention headquarters, will be provided.

The highlight of the Convention will be the Annual AFCEA Banquet on Friday evening. This event, and the Buffet Supper on Thursday evening, will be preceded by industry-sponsored cocktail hours. AFCEA Group Member companies in the New York area have been generous in supporting these get-together Convention activities.

At the Global Communications Symposium on Thursday afternoon "live" international telephone hookups will be featured. This symposium, combined with the Service exhibits and the Armed Forces Day tour of Fort Monmouth, will provide enlightening information on the subject of global communications.

(*See page 39 for complete Convention details.*)

444
new individual members of AFCEA
since the last issue of SIGNAL

AFCEA Trophy Voted At Directors' Meeting

A trophy to be given to the organization or individual having made the most important contribution during the previous calendar year in the field of military communications, electronics or photography will be awarded annually at the AFCEA Convention.

The creation of this award was one of the items of business discussed at the meeting of the board of directors of the AFCEA held February 25 in New York City.

An AFCEA Trophy Committee will be selected annually by the AFCEA national president with the advice of the Executive Committee. The executive vice president of the Association will solicit recommendations for the award from chapters, group members and individual members.

Also discussed at this directors' meeting was a change in the Bylaws of the Association, clarifying honorary membership. Honorary membership may be proposed by at least ten (formerly three) full or life members and approved by a majority vote of the Executive Council.

Honorary membership will be extended to all Chief Signal Officers of the Army and Directors of Naval, Air, and Coast Guard Communications, and Defense Department Directors of Communications, as soon as these officers assume office.

A nominating committee for the 1959 class of directors was appointed at the meeting: Thomas F. Halloran, chairman; Theodore S. Gary, and Donald F. McClure.

Those directors attending the meeting were: Vernon B. Bagnall, George W. Bailey, W. R. G. Baker, Theodore L. Bartlett, Maj. Gen. Gordon A. Blake, USAF, Roland C. Davies, E. K. Foster, Theodore S. Gary, Thomas F. Halloran, William V. Kahler, Donald F. McClure, Joseph R. Redman, and Robert C. Sprague.

DINNER TO HONOR GENERALS BACK AND O'CONNELL

A testimonial dinner honoring Major General George I. Back, retiring Chief Signal Officer, United States Army, and the Deputy Chief Signal Officer, Major General James D. O'Connell and their wives will be given by the Washington Chapter of the AFCEA.

The dinner will be held March 25 at the Hotel Shoreham in Washington, D. C. Toastmaster will be Major General Gordon A. Blake, Director of Communications, United States Air Force, and a director and first vice president of the Association.

Maj. Gen. Gordon A. Blake, Director of Communications, USAF, and First Vice President of the AFCEA, presents the charter for the new Montgomery Area Chapter to Lt. Col. George D. Meserve, President.

New AFCEA Chapters

Northwest Florida

Petition for charter for the Northwest Florida Chapter was signed by 37 members at an organizational meeting on December 30th. Sponsored by AFCEA members at Eglin Air Force Base, the chapter plans to draw on a potential membership from surrounding installations, such as the Naval Air Station at Pensacola, Tyndall Air Force Base, etc.

President of the chapter is Lt. Col. Francis E. Quinlan, Director of Communications and Electronics, DSC/O, Air Proving Ground Command; vice presidents are: Lt. Col. Philip E. Hopkins, Chief, Electronics Division, Air Force Operational Test Center; and Major John F. Arcuri, C&E Staff, Eglin AFB; secretary-treasurer — Bert O. Yerkes, staff advisor, DCS/O-C&E, Air Proving Ground Command.

The chapter was assisted in its organizational work by Willard L. Moor, Southeastern Regional Representative, Philco Tech Rep Division, who is also initiating plans for other AFCEA chapters in the State of Florida.

Montgomery Area

The Montgomery Area Chapter, with headquarters at Maxwell Air Force Base, was officially chartered on February 14th by Major General Gordon A. Blake, Director of Communications, USAF, and first vice president of the association.

Addressing a luncheon meeting at Maxwell Air Force Base, General Blake stressed the aims and objectives of the association and presented the chapter charter to Lt. Col. George D. Meserve, chapter president.

The other officers of the new chapters are: first vice president—Scears Lee, Jr., Southern Bell Telphone and Telegraph Co., Montgomery; second vice president—Lt. Col. George S. Wal-

(*Continued on page 38*)

New RCA Radar "Weather Eye" Sees Through Storms

In our time, man has won round after round in the century-old contest against the elements.

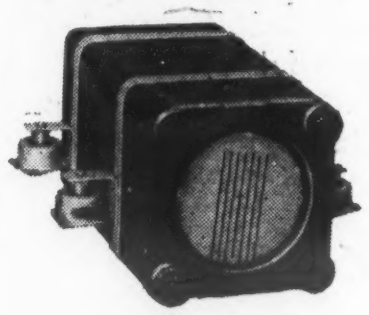
For thousands of years, caravan leaders, ship captains, and now airplane pilots—men responsible for the safe transport of travelers and merchandise—have studied the skies. What unseen far-distant dangers lurked there? Fog? Storm? Hurricane?

The most recent scientific victory is something new in Radar—an electronic "Weather Eye" developed by RCA.

In airplanes, this supersensitive instrument peers miles ahead. It gives advance warning of weather disturbances. The signals on its radar screen point the way to a safe course *around* storm areas, or even *through* them.

The leadership in electronic research that made the "Weather Eye" possible is inherent in all RCA products and services. And at the David Sarnoff Research Center of RCA, Princeton, N. J., scientists are continually at work to extend the frontiers of "Electronics for Living"—electronics that make your life easier, safer, happier.

New RCA Weather Mapping Radar weighs under 125 pounds, takes little space in a plane.



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RADIO CORPORATION OF AMERICA

ELECTRONICS FOR LIVING

born, Chief, Communications Division, Air Command and Staff College; secretary—CWO Woodfin O. Walker, 2047th AACS Squadron; treasurer — Irvin Gassenheimer, Jr., Mercantile Paper Co., Montgomery.

Colonel Meserve, who is Chief, Communications Branch, Air University, was formerly active in the Kansas City Chapter of the association, and Colonel Walborn was the first president of the Scott-St. Louis Chapter.

Pennsylvania State University

Application for charter for a student chapter at Pennsylvania State University was received and approved at national headquarters early in January.

Chapter officers have been chosen as follows: president—H. Diehl McKalip; vice president—Curtis R. Hare; secretary—Robert S. Moyer; treasurer—Bernard I. Kleinstub. Faculty advisor is Major Robert H. Bullard, SigC, who was instrumental in organizing the chapter.

The new AFCEA chapter is replacing the Pi Tau Pi Sigma Signal Corps fraternity which was discontinued at Pennsylvania State when the Signal Corps ROTC unit there was changed to Branch General.

Introducing AFCEA's New Group Members

Bomac Laboratories, Inc.

Bomac Laboratories, Inc., of Beverly, Massachusetts, manufacturers of electron tubes and devices, became a group member of AFCEA during January.

The following company representatives have been named to membership in the Association: Henry J. McCarthy, president; Harold C. Booth, treasurer; Harold Heins, director of engineering; Richard J. Broderick, controller; Earle D. Benson, sales manager; Louis S. Tremblay, plant manager; George E. Carter, chief engineer; George W. Carter, chief industrial engineer; Thomas G. Prescott, chief production engineer, and Raymond C. Svenson, section head, test engineering department.

Kay Lab

Another recent addition to the list of AFCEA group members is Kay Lab of San Diego, California, manufacturers of electronic communication and control equipment.

La Motte T. Cohu, chairman of the board, R. T. Silberman, general manager, and Richard E. Langworthy, chief engineer, will serve as company representatives in the Association.

Marion Electrical Instrument Company

Marion Electrical Instrument Company joined the Association as a group member in January. Located in Manchester, New Hampshire, this company specializes in the production of ruggedized, hermetically sealed and standard electrical meters.

The following officials have been named to be full members of the association under this group membership: Roscoe A. Ammon, president; C. A. Akeson, vice president; F. Gaffney, vice president; E. E. Doherty, sales manager; H. A. Donahue, Jr., aviation sales manager; H. L. Schachat, government sales manager, and Carl Heath, purchasing agent.

Phelps Dodge Copper Products Corporation

The Phelps Dodge Copper Products Corporation was received into the Association during January as a group member. Specializing in the fabrication of copper products, the company has six different divisions located throughout the country, with main offices in New York, N. Y.

These officials will serve as AFCEA company representatives under Phelps Dodge's group membership: Howard T. Brinton, president; Weightman Edwards, vice president; Edgar P. Dunlaevy, vice president; Kenneth S. Wyatt, engineer of cables, and F. W. Lemly.

Rocke International Corporation

Rocke International Corporation of New York, N. Y., export managers, joined the AFCEA as a group member in January.

The following have been designated by the company to be AFCEA members under this group membership: Arthur J. Rocke, chairman of the board; L. A. de Barros, president; D. W. A. Pleasanton, executive vice president; G. Lainer, chief engineer; A. S. Santos, broadcast division; G. Karron, communications division; J. de Bragga, aviation division; and M. A. Coreth, field liaison.

Stelma, Incorporated

Another new group member in January was Stelma, Incorporated, Stamford, Connecticut, manufacturers of carrier current equipment and microwave and radar test devices.

Chosen as company representatives were: Burton Bernard, president; Lawrence Carver, vice president; Joseph Laudadio, assistant treasurer; Irving Gallatin, sales engineer; Richard Yoder, chief engineer; Clarence Allen, production foreman; Adolph Jablonski, technican; Edward Van Allen, technician; Henry Sanborn, engineer.

Technology Instrument Corporation

Another company which took out a group membership in the AFCEA during January was Technology Instrument Corporation. The Acton, Massachusetts, firm is a designer and manufacturer of precision components and electronic apparatus.

The following members of the company have been designated AFCEA company representatives with a full membership in the Association: Frank R. Perier, general manager; John S. Bailey, administrative assistant; Hollis L. Gray, sales engineer manager; Lauren M. Burgess, mechanical engineer; George Bartlett, purchasing agent; Pierre Martin, manager, government sales; Lee Maserian, instrument engineer; Fred Aldrich, sales engineer; Richard W. Houghton, manager, quality control; and Darrel W. Gustafson, sales engineer.

Transitron Electronic Corporation

Transitron Electronic Corporation of Melrose, Massachusetts, manufacturers of semiconductors, became a group member of the AFCEA during February.

Dr. David Bakalar, president; Leo Bakalar, treasurer; James B. Hangstefer, sales manager; and Dr. Gunther Rudenberg, director of research, will serve as company representatives in the Association.

Vectron, Inc.

The Waltham, Massachusetts, firm of Vectron, Inc., specializing in electro-mechanical engineering and production, joined the AFCEA as a group member during January.

New members of the Association from Vectron are: F. H. MacLeod, president; Harold Adler, vice president; U. V. Turner, executive assistant to the vice president; Stewart K. Gibson, commercial sales manager; Arra S. Avakian, executive engineer; Harvey Karp, chief electrical engineer; W. B. Bowers, project manager; Andrew C. Bayle, project manager; Edward L. Worth, project manager; and H. F. McEnness, assistant to the president.

Will YOU be there?

where?

in New York and Fort Monmouth

for the

9th Annual AFCEA Convention

May 19 • 20 • 21

Theme: Global Communications

Schedule of Events

THURSDAY, MAY 19th—The registration desk at the Hotel Commodore, Convention headquarters, will be open at 8:00 A.M. The chapter presidents' meeting will be held at 9:30 A.M. The first event for all AFCEA members and guests is the Global Communications Symposium and Keynote Address at 2:30 P.M., featuring outstanding leaders from Industry, Government and the Services.

The evening activities include a buffet-dinner at 7:30, preceded by an industry-sponsored cocktail hour.

FRIDAY, MAY 20th—Again, registration at the Hotel Commodore anytime after 8:00 A.M. The Board of Directors and National Council will meet at 9:00 A.M. In the afternoon, all AFCEA members and guests make a special tour of the United Nations Building.

The Annual AFCEA Banquet will be held at 7:30 A.M. in the Grand Ballroom of the Hotel Commodore. At 6:00, before the Banquet, there will be another industry-sponsored cocktail hour.

SATURDAY, MAY 21st—AFCEA members and guests attending the Convention have been invited to participate in the Armed Forces Day celebration at Fort Monmouth. Special exhibits and tours have been arranged for AFCEA's benefit, and luncheon will be served on the Post. A highlight of the tour will be inspection of the Signal Corps Engineering Laboratories' new headquarters, the Hexagon. The home of the Army Signal Corps plans this to be an Open House for AFCEA Convention-goers.

LADIES LADIES LADIES

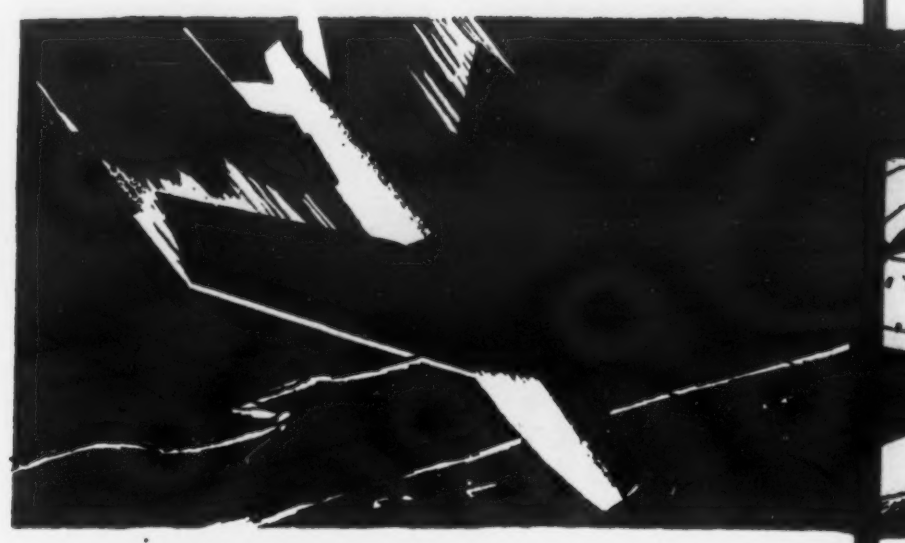
A Special Invitation to You

In addition to the scheduled activities outlined above, at which all the ladies are welcome, there will be a special program, featuring luncheons, fashion shows, and tours, arranged especially for the ladies while they are in New York City. At Fort Monmouth, the ladies and gentlemen will follow in the same program.

FOR **KLYSTRONS** AND TRAVELLING WAVE TUBE

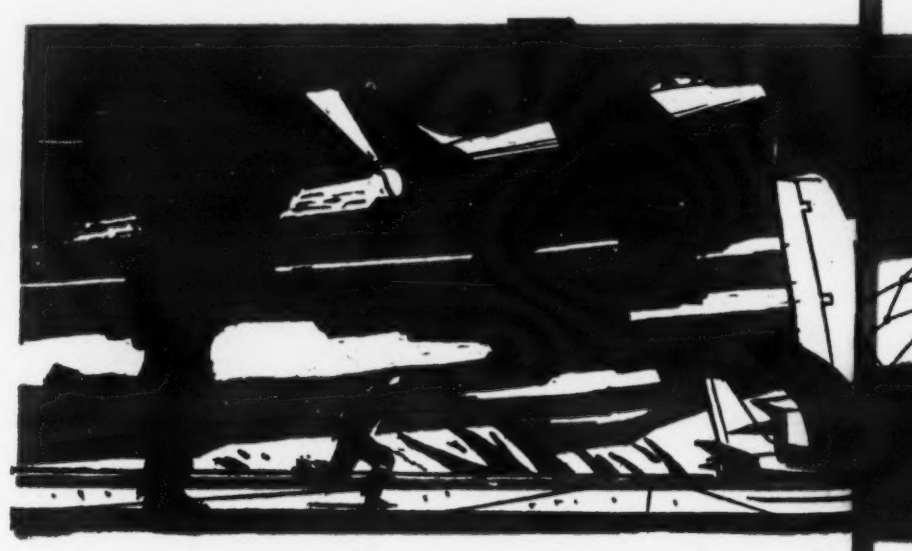
SPERRY CAN MEE

IN RADAR DEFENSE, Sperry's Multi-Megawatt Klystrons hold frequencies 20 to 200 times closer than conventional radar limits, permit obtaining improved information from search radars.



IN GUIDED MISSILES, Sperry's Multi-Mega Klystrons make possible more accurate control of miss permitting guidance over longer paths.

IN COMMUNICATIONS, Sperry's low powered microwave beam tubes are providing years of trouble-free service at unattended relay stations.



IN CONTINENTAL DEFENSE, Sperry's mic wave beam tubes meet the needs of military radars communications' networks which protect our shores.

IN TELEVISION, present Sperry Klystrons extend TV microwave networks. More improvements in TV transmission are possible with new Sperry microwave beam tubes.

IN MEDICINE, newly developed linear accelera give promise of improved X-ray treatment.

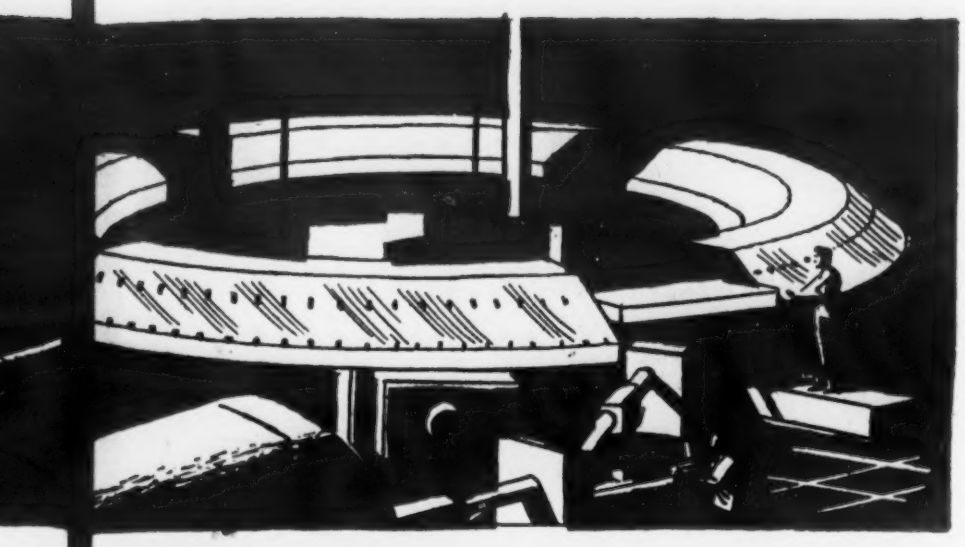
BE

E YOUR NEEDS

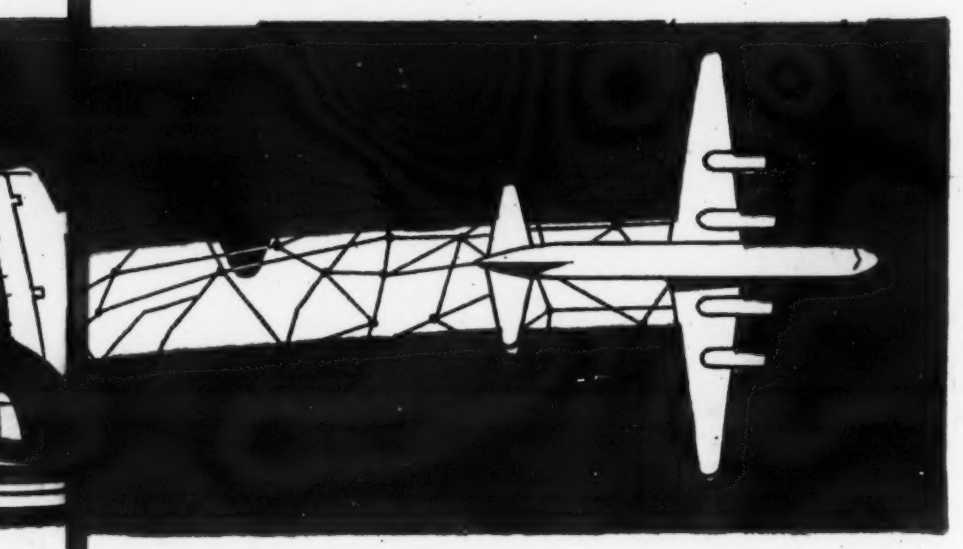
This is the 17th year of continuous development and production of microwave tubes by Sperry. Out of this experience has come a wide range of tubes for today's important microwave uses, covering frequencies from 200 mc. to 40,000 mc., and with power from a few milliwatts to many million watts. Sperry microwave beam tubes meet military and industrial requirements because of their dependability and economy.

Tomorrow's needs of the development engineer in advanced system design will be aided by the specialized knowledge of new microwave beam tube development available at Sperry.

The facilities of the Sperry laboratories, devoted to microwave beam tube and microwave test equipment development, and the new production plant of the Sperry Electronic Tube Division in Gainesville, Florida, are at your service.



ATOMIC ENERGY, Sperry's Multi-Megawatt Klystrons provide stable driving power for atom smashers and high energy X-ray devices for scientific research.



AIR NAVIGATION, Sperry Klystrons power a military radio system to guide air traffic precisely.

IN UTILITY AND IN INDUSTRIAL USE, Sperry microwave beam tubes permit accurate long distance controls, such as regulating pipe line flow of oil and gas throughout the country.

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You will also welcome the simplified circuitry, ease of assembly and cost reductions now possible in transistorized products. And Philco production facilities assure a dependable supply of high quality transistors *—at a price which makes their use practical in new product design!*

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Communications—Electronics—Photography

Listed below are the firms who are group members of the Armed Forces Communications and Electronics Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCEA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

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Aircraft Radio Corp.
Allied Control Co., Inc.
Allied Radio Corporation
Almo Radio Company
American Cable & Radio Corp.
American Institute of Electrical Engineers
American Machine & Foundry Co.
American Phenolic Corporation
American Radio Relay League
American Telephone & Telegraph Co.
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Argus Cameras, Inc.
Arnold Engineering Company
Atlas Precision Products Co.
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Automatic Electric Company
Automatic Electric Sales Corp.
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Barry Corporation, The
Bell Telephone Company of Pa.
Bell Telephone Laboratories, Inc.
Bendix Radio
Berkshire Transformer Corp.
Bliley Electric Company
*Bomac Laboratories, Inc.
Breeze Corporations, Inc.
Bruno-New York Industries Corp.
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Cargo Packers Inc.
Carolina Telephone & Telegraph Co.
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Copperweld Steel Company
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Crosley Division-Avco Mfg. Corp.
Dana, P. A., Inc.
Designers for Industry, Inc.
De Vry Corporation
Diamond State Telephone Co.
Dictaphone Corporation
Downing Crystal Company
Dukane Corporation
DuMont, Allen B., Laboratories, Inc.
Eastman Kodak Company
Electronic Associates, Inc.
Elgin Metalformers Corporation
Espey Manufacturing Co., Inc.
Federal Telecommunication Laboratories
Federal Mfg. and Engineering Corp.
Federal Telephone & Radio Corp.
General Aniline & Film Corp.
General Cable Corporation
General Communications Co.
General Electric Company
General Telephone Corp.
General Transformer Co.
Gilfillan Bros., Inc.
Globe Wireless, Ltd.
Gray Manufacturing Co.
Guardian Electric Mfg. Co.
Hallicrafters Company, The
Haloid Company
Hammarlund Manufacturing Co., The
Hazeltine Electronics Corp.
Heinemann Electric Company
Hercules Motor Corp.
Hitemp Wires, Inc.
Hoffman Laboratories Incorp.
Hopkins Engineering Co.
Hughes Aircraft Company
Illinois Bell Telephone Co.
Indiana Bell Telephone Co.
Indiana Steel & Wire Co.
Institute of Radio Engineers
International Business Machines
International Resistance Co.
International Tel. & Tel. Corp.
Jacobsen Manufacturing Co.
Jansky & Bailey, Inc.
*Kay Lab
Kellogg Switchboard & Supply Co.
Keystone Electronics Co.
Kleinschmidt Laboratories, Inc.
Lavoie Laboratories
Leich Sales Corporation
Lenz Electric Manufacturing Co.
Lewyt Corporation
Librascope, Inc.
Loral Electronics Corporation
Machlett Laboratories, Inc.
Magnavox Company
Maida Development Company
Mallory, P. R., & Co., Inc.
*Marion Electrical Instrument Co.
Merit Coil and Transformer Corp.
Michigan Bell Telephone Company
The Montgomery Company
Motorola, Inc.
Mountain States Tel. & Tel. Co.
Muter Company, The
Mycalex Corporation of America
National Company, Inc.
Nelson Technical Enterprises
New England Tel. & Tel. Co.
New Jersey Bell Telephone Company
New York Telephone Company
Northwestern Bell Telephone Co.
Oak Manufacturing Co.
Ohio Bell Telephone Co.
O'Keefe & Merritt Company
Otis Elevator Co., Electronic Division
Pacific Mercury Television Mfg. Corp.
Pacific Telephone & Telegraph Co.
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*Phelps Dodge Copper Products Corp.
Philco Corporation
Photographic Society of America
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Plessey Company, Ltd., The
Prodelin Inc.
Radiart Corporation
Radio Condenser Company
Radio Corporation of America
Radio Engineering Laboratories Corp.
Radio Frequency Laboratories, Inc.
RCA Photophone, Ltd.
RCA Victor Division
Radio Receptor Company
Raymond Rosen Engineering Products, Inc.
Ray-O-Vac Company
Raytheon Manufacturing Company
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Remington Rand, Inc.
Remler Company, Ltd.
*Rocke International Corp.
Saxonburg Ceramics
Seeburg, J. B. Corporation
Society of Motion Picture & Television Engineers
Sonotone Corporation
Soundscriber Corp.
Southern Bell Tel. & Tel. Co.
Southern New England Tel. Co.
Southwestern Bell Telephone Co.
Sparton Radio-Television Division, Sparks-Withington Co.
Sperry Gyroscope Company
Sprague Electric Company
Stackpole Carbon Company
Standard Coil Products Co., Inc.
Standard Piezo Co.
Standard Telephone & Cables, Ltd.
Stanford Research Institute
*Stelma, Incorporated
Stewart-Warner Corporation
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Sylvania Electric Products, Inc.
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Telephone Services, Inc.
Telephonics Corporation
Teletype Corporation
Texas Instruments, Inc.
Times Facsimile Corporation
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Triad Transformer Corp.
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Tung-Sol Lamp Works, Inc.
United States Rubber Company
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United Transformer Co.
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Voltz Brothers, Inc.
Waterman Products Co., Inc.
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Whitney Blake Co.
Wickes Engineering & Construction Co.
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Wollensak Optical Company
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*Company accepted for AFCEA Group Membership since the last issue of SIGNAL.

U. S. ARMY PHOTOGRAPH

Conversation piece for Uncle Sam

When the Signal Corps came to Western Electric and Bell Laboratories with ideas for a new field telephone set, we gladly put at their disposal all of our development and production know-how.

Naturally, this new set had to be really rugged. And you can bet it is. Weighing but 8½ pounds, it can take the pounding of heavy artillery shock waves, yet transmit a whisper. It works in temperatures from 40° below zero to 130° above – can even be dunked in water without damage.

This improved set can talk 20 to 30% further than the old set on just a pair of flashlight batteries. Without batteries – even with the transmitter damaged – the soldier can talk up to five miles by speaking into the receiver.

To meet varied combat conditions, there's a new "woodpecker" signal that can be adjusted from a barely audible level to a clatter that cuts through battle noise. Another new feature is the tapered handset which fits easily under a helmet.

Everybody has heard how progressive telephone technology has been applied to national defense weaponry—radar, guided missile systems, and so on – but it should be remembered that technological progress is also being made in the less dramatic but equally important field of telephone communications systems for our Armed Forces.

Western Electric

MANUFACTURING AND SUPPLY UNIT OF THE BELL SYSTEM

Chapter News

Atlanta's February 14th meeting was addressed by Maj. Gen. Gordon A. Blake, Director of Communications, USAF. Shown, left to right: Brig. Gen. John B. Cary, Brig. Gen. A. W. Beeman, Chapter President Kelly Mosley, General Blake, and Brig. Gen. Louis W. Truman.

Atlanta

One hundred and ninety members and guests turned out for the chapter's February 14th meeting at which Major General Gordon A. Blake, Director of Communications, USAF, was the guest speaker. General Blake was introduced to the gathering by Brig. Gen. Louis W. Truman, Chief of Staff, Third Army.

In his capacity as first vice president of the AFCEA, General Blake congratulated the chapter on its accomplishments. He pointed out that the numerous military installations and industrial headquarters in the Atlanta area enhance the importance of the chapter's mission and cited the Southern Bell Telephone and Telegraph Company for its fine support of chapter activities. He also stressed the contributions being made by the AFCEA in the communications, electronics and photographic fields of both industry and the services.

General Blake then went on to deliver his main address concerning the structure of the Air Force Command. With the aid of slides, he described the various levels of command and then showed how the USAF organization has been developed to provide for the "complex Air Force of today." Two excellent Air Force films, "Air Science in Action" and "Target Nevada," were shown at the conclusion of his talk.

Augusta-Camp Gordon

Capt. Charles E. Rogers, chief of the television branch, The Southeastern Signal School, was guest speaker at the January 20th dinner-meeting held at Timmerman's restaurant. Captain Rogers gave an interesting talk on military television as a training media, stressing the evaluation of television as employed on a test basis at The Southeastern Signal School.

The meeting was presided over by Col. Otto T. Saar, new chapter president. Committee reports were made by Capt. John E. Coghlan, representing the chairman of the house committee; Lt. Col. Russell R. Randell, chairman of the program committee; and Col. Lowrey R. Moore, chairman of the civil defense committee.

Baltimore

The chapter's recent meetings have featured diversified programs. Detailed reports, however, had not been received at headquarters as SIGNAL went to press.

The November meeting was held at Fort Meade with the 100" Signal Corps camera and the mobile photographic laboratory the highlights of the tour.

The Western Electric Company was host to the chapter on December 14th. Following a dinner-meeting, the members toured the plant to see the latest techniques used in the manufacture of cable, various telephone apparatus, rubber covered wire and cords, etc.

The Air National Guard of Maryland was host at Harbor Field on January 18th. A tour of the facilities included communications equipment, Link Trainer, photographic laboratory, parachute room and armament shop.

Boston

The regular bi-monthly meeting of the chapter was held at the Officers' Club of the Naval Shipyard, Charlestown, on January 13th. A social hour and dinner preceded the program, with sixty-five members in attendance.

Dr. Rudolph Langer of the Federal Civil Defense Agency was principal speaker and emphasized the role of industry in the civil defense setup.

It was announced by Arthur S. Mullins of the New York Central Railroad that the March program would be sponsored by the New York Central and New York, New Haven and Hartford Railroads and would feature railroad communications systems.

Chicago

Committee chairmen directing the various phases of activity of the Chicago Chapter during the current year are as follows: program—Carrington H. Stone, consulting engineer; membership—Donald Nelson of Nelson Technical Enterprises; industrial relations—Dwain Temple, Chief of the Industrial Branch, Chicago Railway Office, Signal Corps Supply Agency; reserve affairs — Orville Ostberg, Kellogg Switchboard & Supply Company;

Officers and directors of the Baltimore Chapter shown at a recent executive committee meeting. Seated, left to right: Helen Shipley, recording secretary; Donald C. Lee, president; Col. Charles M. Baer, vice president; George C. Ruehl, Jr., chairman of the board; Commander Algers representing Capt. C. W. Thomas, USCG, vice president; standing, left to right: Emmett T. Loane, co-chairman, membership committee; Karl H. Keller, secretary; Robert B. Alexander, program committee; Henry B. Yarbrough, vice president; John M. Pearce, vice president; Edwin R. Harrall, membership chairman; Dal Fausnaugh, treasurer; and James L. McGowian, program committee.

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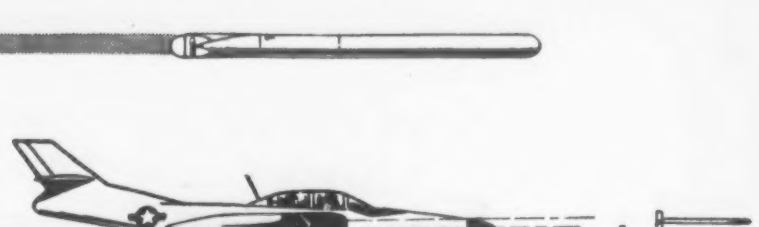

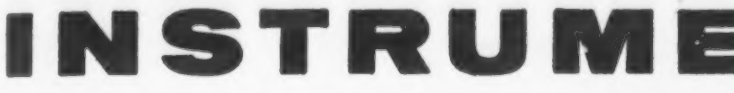

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Chicago's meeting at the Standard Coil Products Company plant. Shown at head table, left to right, are: Carrington H. Stone, chapter vice president; Edwin Thias, vice president, Standard Coil Products; Capt. E. F. Metzger, C.O., Electronics Supply, Great Lakes Naval Training Station; Louis Martin, general sales manager, Standard Coil; James O. Burke, executive vice president, Standard Coil; Fritz Franke, chapter president; Henry J. McDonald, chapter secretary-treasurer; William J. Halligan, chairman of the board, The Hallicrafters Co.; Col. R. L. Finkenstaedt, chief, Chicago Air Procurement District; Raymond K. Fried, chapter vice president.

armed forces—Col. Marlin S. Moody, Signal Officer, Fifth Army; publicity—Maj. Neil T. Regan, public relations counsel, Hallicrafters Company; ways and means—Emerson Mead, Kleinschmidt Laboratories.

Dayton-Wright

A Christmas cocktail party on December 23rd marked the holiday season and also served as a farewell party for Roy and Jane Merwin, former chapter president and secretary, prior to their departure for upstate New York. Highlight of the evening was a lively auction of Christmas prizes.

Recent additions to the board of directors are: John W. Kinnally of Philco and Wilbur F. McKeehan of General Electric.

Major General Gordon A. Blake, Director of Communications, USAF, addressed the chapter's dinner-meeting at Wright Patterson Air Force Base on January 20th. Discussing "Air Force Utilization of Leased Communications-Electronics Facilities," General Blake told the group that an expansion of the communications local purchasing system is expected, and pointed out that about $200,000,000 is being spent annually by the Air Force for 75,000 different electronic items, including highly complicated electronic countermeasures.

Major General C. S. Irvine, Deputy Commander, Weapons Systems, AMC, spoke briefly at the conclusion of the main address and urged close cooperation between contractors and the Air Force so that the United States can keep ahead of the "competition."

Chapter President Harry Blackburn, Sylvania Electric Products Co., presided, with Col. F. J. Shannon acting as master of ceremonies. The Air Force program was opened by Brig. General C. H. Mitchell, Deputy Director for Production, AMC.

Among the 175 members and guests in attendance were: Dr. H. Guyford Stever, new Chief Scientist of the USAF; Dr. Ivan A. Getting and Mr. H. A. McGettigan, Raytheon Manufacturing Co.; Lt. Col. Tex Brewer, Tinker AFB; Brig. Gen. V. R. Haugen, Col. C. H. Lewis, Lt. Col. and Mrs. D. R. Longino, Lt. Col. E. C. Parkerson, Lt. Col. J. F. Strother and Maj. W. T. Olsson, WPAFB; Arthur J. Schmitt, president of American Phenolic Corp., and Dave Higgins, vice-president, Hallicrafters Company.

Shown at Dayton-Wright Chapter's January 20th meeting at Wright-Patterson Air Force Base, left to right: Maj. Gen. C. S. Irvine; Chapter President Harry C. Blackburn; Maj. Gen. Gordon A. Blake, guest speaker; Brig. Gen. C. H. Mitchell; and Col. Frank J. Shannon, Sr., chapter vice president.

Decatur

The opening meeting of the new year was held on January 20th and was presided over by Col. Edwin Fritz, new president, who introduced the other new officers to the gathering.

Committee chairmen were appointed as follows: program—Lt. Col. Robert A. Grohne, Decatur Yacht Club; membership—Richard R. Crum, Crum Distributing Co.; financial—Herman C. Tille, Decatur Signal Depot; national security—Col. E. A. Schultz, Illinois Power Company; reserve activities—Capt. W. A. Hayward, Decatur Signal Depot; liaison—Henry E. Malone, Decatur Signal Depot; publicity—William R. Winn, Decatur Signal Depot; induction program—Leonard S. Hall, Decatur Signal Depot.

Members of the board of directors are: Chester Badgett, D. E. Beneze, Maj. R. M. Burns, Jr., Gil Slifer, Adolph Hetzler and Henry Malone.

Following the business session, a film on "Guided Missiles" was shown which explained the theory of operation and tactical use.

Fort Monmouth

Dr. Oliver G. Haywood, manager of the Missiles System Laboratory, Sylvania Electric Products, Inc., was guest speaker at the December 2nd chapter meeting.

A West Point graduate and former member of the famed "Manhattan" Project, Dr. Haywood led off his talk by referring to the ancient beginnings of the rocket or missile as it is called today. From the inception of gun powder with its rockets, Dr. Haywood stated, we have now progressed to the intercontinental missile leading to today's "anti-missile missile." Since World War II, he said, the speed of missiles has increased so that in the past seven years 165 miles per hour has been added each year. The present intercontinental missile now travels at speeds of 20,000 feet per second.

"Because of the overwhelming significance of the missiles," Dr. Haywood stated, "materials should be purchased for quality only rather than price quoted" and added, "we must not get too fascinated with these developments and forget to develop missiles for definite uses."

The speaker felt there should be more mutual respect between government and science leading to a more significant use of the research establishment within the military. He pointed out that we no longer experiment with "trial and error" but rather "trial and catastrophe."

The chapter's first meeting of the new year was held on January 27th at Gibbs Hall Officers' Club. Attended by

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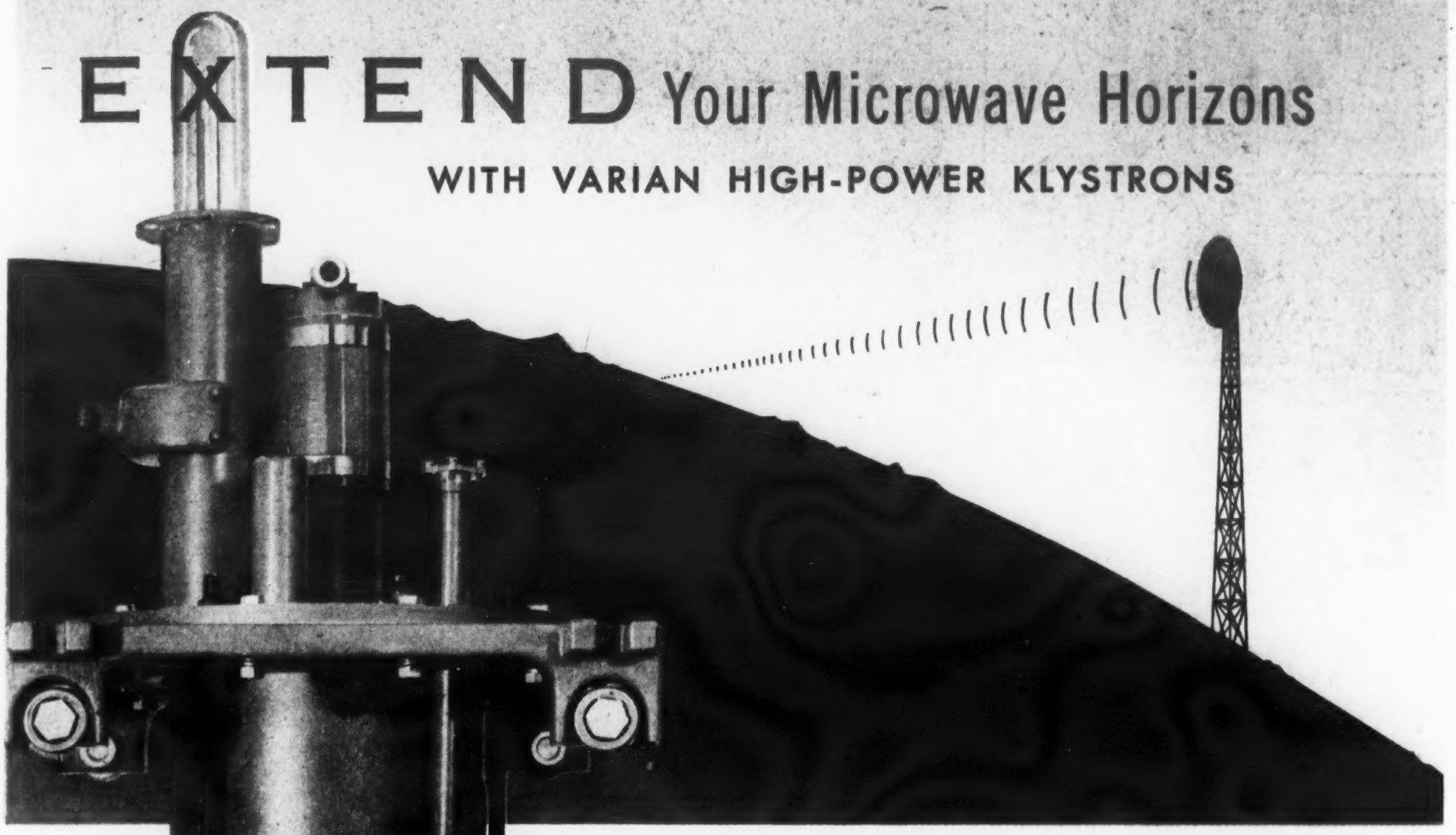

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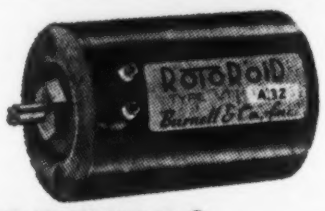

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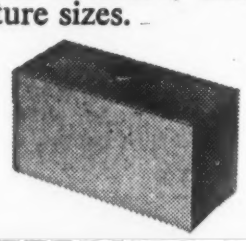

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FIRST IN TOROIDS AND RELATED NETWORKS

At the January meeting of the Fort Monmouth Chapter (L to R): Col. George P. Dixon, AFCEA Executive Vice President; Col. John C. Monahan, chapter president; and William McCabe, Public Relations Supervisor, New Jersey Bell Telephone Company, who presented a lecture-demonstration on "Words, Music and Waves."

more than 200 members and guests, the meeting got underway with a cocktail hour followed by dinner in the Sapphire Room.

Col. John C. Monahan, new president, welcomed the assembly and then called on Lt. Col. Oscar C. Buser, new secretary, to introduce the committee chairmen appointed for the year as follows: membership—Col. D. W. Eddy, The Signal School; meetings—Lt. Col. K. E. Shiflet, TSS; reserve affairs—M. F. Werksman, TSS; publicity—J. P. Hoffman, SigC Center; fiscal—Lt. Col. M. A. Rubin, SigC Center; reception—A. W. Christopher, Sylvania Electric Products, Inc.; and industrial relations—A. L. Adamson, Electronic Associates.

Plans for the Fort Monmouth Chapter participation in the forthcoming national convention in May were outlined by Col. Joseph E. Heinrich, now of the AT&T Co., who served as chapter president in 1953. A tour of Fort Monmouth will be made on the last day of the convention, May 21st, which coincides with Armed Forces Day.

Col. George P. Dixon, Executive Vice President, was a guest of the chapter and reported on membership growth of the association and on its overall activities.

Program feature of the evening was a lecture-demonstration entitled "Words, Music and Waves" by William McCabe, Public Relation Supervisor for the Bell Telephone Company in Newark.

From a description of the early days of communication—the Pony Express, the experiments of Samuel Morse and the birth of the telegraph—Mr. McCabe went on to demonstrate some of the latest telephone developments. The first was a telephone with a speaker and receiver leaving the user free to use both hands and roam as far as 25 feet away while still in use. Next a photocell controlled music was cut on and off by Mr. McCabe passing his hand through a stream of light. In like manner he also demonstrated the control of sound by focusing a flashlight on a device and varying the intensity.

The vast network of 170 towers relaying telephone messages and television pictures from coast to coast was next demonstrated by the use of a model link. Mr. McCabe adjusted the small "dishes" atop the towers to show how sensitive the narrow beams of radio waves are and how they react.

Geneva

The second meeting of the Geneva Sub-Chapter was held at the Airport Restaurant, Cointrin (Geneva) Airport,

New officers of the Decatur Chapter, left to right: Lt. Col. Robert A. Grohne, chairman, program committee; Richard R. Crum, first vice president; David W. Richardson, secretary-treasurer; Roman W. Wojcicki, second vice president; and Col. Edwin G. Fritz, president.

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on January 29th. Col. John H. Gayer, chapter president, welcomed the members and guests and outlined the program to follow.

Col. Dane O. Sprankle, vice president, on behalf of the Honorable Frances Willis, United States Ambassador to Switzerland, invited the chapter to hold its next meeting in Berne. The invitation was enthusiastically accepted.

The chairman of the membership committee, Robert V. Lindsey, outlined the purposes of the association and the advantages of membership. As a result, several new members joined the chapter.

It was announced that Cdr. Gerald C. Gross, chapter secretary, was in the United States on sick leave, and Mr. Lindsey was appointed to act as secretary until his return.

A tour of the control tower, message center and radar installations at the Geneva Airport followed the luncheon-meeting. The chapter expressed its appreciation to John Davidson, Geneva TWA Traffic Manager and chapter member, who arranged the tour, and to the officials at Cointrin who were kind enough to act as guides and explain the various operations.

Hawaii

Commander William Ellis, Communication Operations Officer, CINCPACFLT, discussed Naval communications at a luncheon-meeting held at the commissioned officers mess, Pearl Harbor, on January 26th. The Navy was host to the chapter for the occasion.

At the conclusion of the meeting, the members were conducted on a tour of Naval communications facilities in the Pearl Harbor area, including the primary communication center, vault, NTX, relay station and radio photo.

Kansas City

The Wilcox Electric Company, group member of the association, was host to the chapter at its Kansas City plant on January 19th. A total of 84 members and guests were present.

The dinner-meeting was addressed by Col. Gus B. Hoffman, Director of Communications-Electronics, Central Air Defense Force, who discussed military communications problems during peace and war time in the Far East. Following his speech, Colonel Hoffman showed a series of colored slides of scenes he had taken while on duty in Japan and Korea.

After the meeting, a tour was conducted through the Wilcox plant where air ground communications equipment for aviation is manufactured. The various manufacturing processes were explained and there was an exhibit of some of the equipment produced.

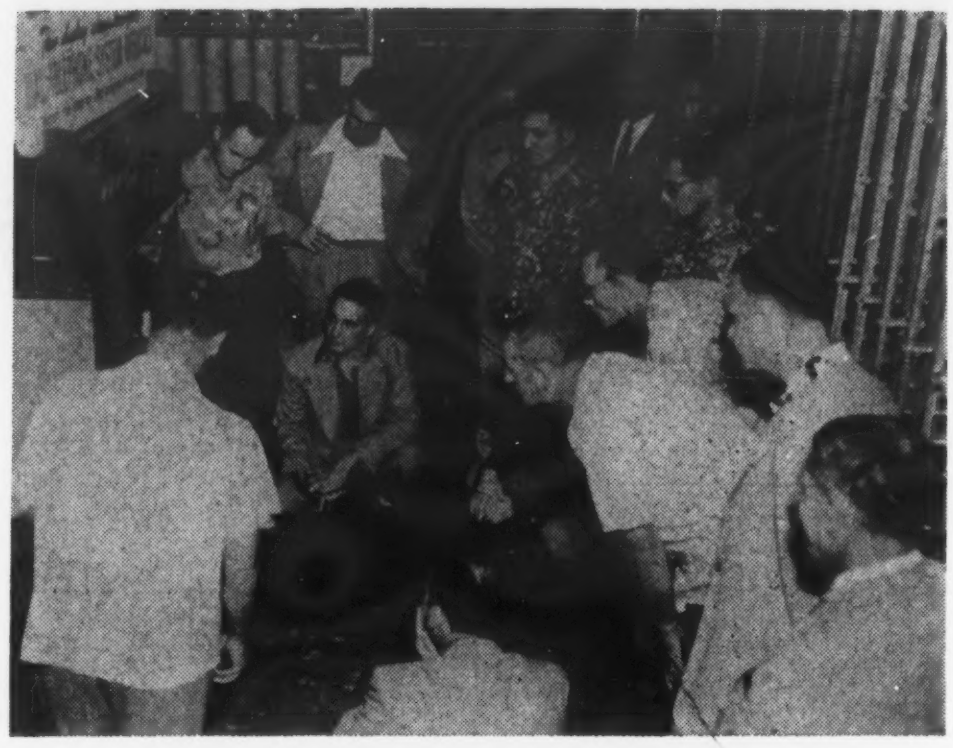
Special guests of the chapter were Maj. Gen. J. B. Crabb, Commander, Central Air Defense Force; Mrs. Crabb; A. J. Esrey, General Manager, American Telephone & Telegraph Co., and Mrs. Esrey.

At a meeting of the officers and directors of the chapter on February 3rd, Col. Carroll S. Miller of Wilcox Electric was elected vice president to succeed R. R. Williams who was being transferred to Milwaukee. Colonel Miller was also appointed to succeed Mr. Williams as chairman of the program committee.

Louisiana

Photography was the subject of the December 8th chapter meeting, with particular attention on its commercial, amateur and military applications. The meeting took place at the Coast Guard commissioned officers mess, with Paul D. Cordes and Anthony G. De Voney as co-chairmen.

Participants in the program were: William Kachelle, Ansco; Lt. Fred Hooks, liaison officer, Naval Air Station; PFC Don White, USA; James C. Kraus and Arthur J. Terjelo, amateur photographers; Frank Lotz Miller, professional photographer; and Bruce Hay, chapter secretary.



A group of Hawaii Chapter members are shown inspecting equipment at the Hawaiian Telephone Company plant in Honolulu during a recent meeting. The tour was followed by a lecture-demonstration on the company's radio telephone operations between the various islands in Hawaii.

New York

Commissioner E. M. Webster of the Federal Communications Commission addressed the January 19th dinner-meeting at the Hotel Belmont Plaza. His subject was "Five Years of Progress in the International Radio Frequency Allocation Problem." In view of the importance of Commissioner Webster's remarks, the chapter is sending copies of his talk to its group member companies.

Col. Allen E. Wharton, new chapter president, announced the appointment of committee chairmen for 1955 as follows: membership—Henry R. Bang, New York Telephone Company; finance—Lt. Col. W. L. Hallahan, Laird and Co.; liaison—George W. Bailey, IRE (national president of AFCEA); armed forces—Col. Charles B. Brown, Signal Officer, First Army; meetings—Lt. Col. J. A. Hartman, Jr., American Cable and Radio Corp., with Leroy Spangenberg, Mackay Radio and Telegraph Co., as acting chairman; reserve affairs — Col. Orville Laird, Mitchel Air Force Base; public relations—Edwin C. Carlson, Mutual Life Insurance Company.

It was also announced that at a meeting of the board of directors Col. Julian

Scene of Kansas City's January dinner-meeting at which the Wilcox Electric Company was host. Following an address by Col. Gus B. Hoffman, Director of C&E, CADF, the group was conducted on a tour of the plant facilities.

Z. Millar, Western Union Telegraph Co., had been elected a director to succeed Maj. W. H. Rivers who had resigned.

Col. Benjamin H. Oliver, Jr., Chairman of the 1955 Convention Committee, reported on the progress being made in arrangements for the national convention to be held in New York in May.

North Texas

Civil defense was the subject of the November 22nd meeting, with Durward J. Tucker of Radio Station WRR, Dallas, who is also Director of Communications for Civil Defense in the Dallas area, as the guest speaker.

At the conclusion of the program, the members participated in a discussion of how the North Texas Chapter can be of assistance in civil defense planning.

The chapter's December activity was a dinner-dance at the Officers Club, Naval Air Station in Dallas. A business meeting on January 24th dealt with plans for civil defense activity, a drive for additional members, and future meetings.

San Francisco

The chapter's annual elections were held on January 27th, with the following chosen to head the chapter during 1955:

President—C. L. Wickstrom, defense activities engineer, Pacific Telephone and Telegraph Co.; vice-presidents—Cdr. S. N. Barton, USNR, manager, Mackay Radio; and Maj. T. D. Razovich, KFRC; treasurer—R. H. Cobb, superintendent, Western Union Telegraph Co.; secretary—K. W. Goossens, staff engineer, Pacific Telephone and Telegraph Co.; historian—Lt. Col. F. L. Treadway, USAR, head of electronics section, Military Sea Transport Service.

Directors—W. G. Phillips, vice president, Globe Wireless; Col. A. B. Cooper, Signal Officer, Sixth Army; Robert Sackman, manager, instrumentation division, Ampex Electric Co.; C. J. Napier, engineer-in-charge, Bolinas transmitter, RCAC; Robert C. Gray, president, Remler Co., Ltd.; Col. H. L. Schnoor, USAR, methods accountant, Pacific Tel. & Tel. Co.; Capt. M. H. McCoy, communications officer, 12th Naval District; John F. Parachini, manager, Radiomarine Corporation of America; Lt. Col. W. G. Damerow, USAR, engineer, Pacific Gas and Electric Co.; Ralph A. Krause, general manager, research division, Stanford Research Institute; Col. Lloyd C. Parsons, immediate past president.

In retiring from the presidency, Colonel Parsons thanked the officers for their assistance during his term of office. He pointed to the gratifying increase in membership and activity and expressed confidence in the chapter's continued growth.

The meeting was held at the Fort Scott Officers Club, Presidio of San Francisco, with Col. Ariel B. Cooper,

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Signal Officer, Sixth Army, host for the evening. Program feature was a Signal Corps film showing pole line construction in Newfoundland.

Scott-St. Louis

Lt. Col. Ernest H. Bonham, Chief, Electronics Division, Directorate of Communications and Electronics, Headquarters, Air Training Command, addressed the January 7th chapter meeting on the subject of "Future Trends in Air Traffic Control."

Describing the traffic jam building up in the skys due to the ever-increasing number of aircraft, Colonel Bonham pointed out that some airports are already being taxed to the limit of their ability. An extensive study has been made by a group of experts to provide faster handling of landings and take-offs and keep the great number of planes aloft without running into each other, in all weather conditions. The high speed of the jet plane creates an additional problem.

The answer will be found in new electronics facilities, which will employ radar and automatic control devices, Colonel Bonham stated. Even parking of planes after landing will require control systems. In giving the highlights of such a program, he pointed out the problems involved in converting from the present radio ranges and other facilities to the new devices. However, he said that a very thorough plan has been worked out so that the old systems will be phased out in an orderly manner to make way for the new ones and at the same time maintain adequate facilities for military, commerical and private air travel.

Annual elections took place during the business session, with Harry L. Cooper of American Telephone and Telegraph Company chosen to head the chapter during 1955.

Other officers elected were: vice presidents—Lt. Col. Loy C. Willis, director of academic training, 3310th Technical Training Group, and Clifford Wassall, defense activities engineer, Southwestern Bell Telephone Co.; secretary—Allan L. Eisenmayer; treasurer—Prosper L. Kinsella (both of the latter are educational specialists of Scott Air Force Base technical schools).

Elected to the board of directors for a two-year term: Col. Gomer Lewis, outgoing president; Michael Ebinger, president of Ebinger Radio and Supply Co.; Albert L. Lenny, general manager, Alton and Southern Railroad; Walter W. VanSkiver, chief, TA&D, 3310th TTG; and B. Roger Robards, equipment chief, Southwestern Bell Telephone Co.

Col. C. E. Beasley, commander, 3310th TTG, was chosen to fill the unexpired term of Col. C. I. Ferris on the board of directors. Other incumbents on the board with one more year to serve are: Read Adm. R. E. Melling, USN (ret.); Harry E. Vermillion, superintendent of operations, Western Union Telegraph Co.; Earl Hagen, Long Lines, AT&T Co.; and Robert M. Hanson, chief of operations, St. Louis Civil Defense Administration.

Seattle

The Western Union Telegraph Company was host to the Seattle Chapter on December 8th. Following a dinner-meeting at the Elks Club, the members assembled at the Western Union office on Cherry Street where an interesting program had been arranged by Superintendent A. A. Baird, a former president of the chapter.

First on the program was a talk and demonstration of the Western Union intrafax system by William M. Humason, sales manager. This was followed by a conducted tour of the building and facilities.

Among those present were the following Western Union officials from Portland, Oregon: Ralph Poole, area engineer; Tom Krietzer, maintenance supervisor; Roy Hill, leased wires sales representative; and Mr. Mendoza, engineer.

Lt. Col. Elmer R. Higgins of the Alaska Communication System was elected president of the chapter at the annual elections on January 12th. The other officers for 1955 are: vice president—Ray Laine, Seattle Radio Supply Co.; treasurer—Lee David, Boeing Airplane Co.; secretary—Merrill R. Stiles, ACS.

Trustees are: Col. M. R. Kunitz, ACS; A. A. Baird, Western Union; T. W. Copeland, ACS; Warren J. Taylor, Boeing Airplane Co., retiring president; and Merrill Peoples, ACS.

Committee chairmen were appointed for the year as follows: membership—Warren J. Taylor; and program—Hershal Wandling, Radio Products Sales Co.

Program feature of the evening was a lecture-demonstration on the subject of "Plastics" by Oree Weller of the Boeing Airplane Company. Mr. Weller discussed the use of plastics in aircraft for reduction of weight, vibration in small delicate components, and cost. He stated that plastics are being used in conjunction with certain types of structural members to obtain the necessary strength with a reduction of weight as compared to all-metal members.

Various samples of plastics having special characteristics were displayed by the speaker. One item of special interest was aluminum honeycomb "sandwich" construction used in conjunction with plastic filler to obtain lightweight structural members.

South Texas

Major General P. G. Clarkson, formerly the Joint Task Force Commander for atomic and thermo-nuclear tests at Eniwetok Atoll in the South Pacific, addressed the December 1st meeting at the Fourth Army Officers Club.

To prepare the audience for a film and discussions to follow, General Clarkson gave a thorough briefing of the organizational structure of the task force, the aims and the hoped-for results of the various tests to be con-

Participants in Louisiana Chapter's meeting on photography: seated (l to r): William Kachelle, Anthony G. DeVoney, Lt. Fred Hooks and Paul D. Cordes; standing (l to r): PFC Don White, James C. Kraus, Arthur J. Terjelo, Frank Lotz Miller and Bruce Hay, chapter secretary.

MINIATURE PULSE TRANSFORMERS

Type 10Z
tubular pulse transformer

Type 15Z
miniature bathtub pulse transformer

Type 20Z
drawn-shell bathtub pulse transformer

Type 40Z
plug-in pulse transformer

NOW YOU CAN CHOOSE from eighteen standard pulse transformers in four major construction styles, all in quantity production at Sprague. The standard transformers covered in the table below offer a complete range of characteristics for computer circuits, blocking oscillator circuits, memory array driving circuits, etc.

These hermetically sealed units will meet such stringent military specifications as MIL-T-27, and operate at temperatures up to 85°C. Special designs are available for high acceleration and high ambient temperature operation. In addition, the electrical counterparts of each transformer can be obtained in lower cost housings designed for typical commercial environment requirements.

Complete information on this high-reliability pulse transformer line is provided in Engineering Bulletin 502A, available on letterhead request to the Technical Literature Section, Sprague Electric Company, 287 Marshall Street, North Adams, Massachusetts.

ELECTRICAL CHARACTERISTICS OF SPRAGUE PULSE TRANSFORMERS

Type No.	Turns Ratio	Pulse Width μ seconds	Rise Time μ seconds	Primary Inductance	Leakage Inductance	Repetition Rate	Load and Output	Typical Applications
10Z1	5:1	0.1	0.04	200 μH	5 μH	1 to 2 MC	15 volts 100 ohms	Used in digital computer circuitry for impedance matching and inter-stage coupling. Pulses are of sine wave type.
10Z2	4:1	0.07	0.03	200 μH	20 μH	1 to 2 MC	20 volts 100 ohms	
10Z3	1:1	0.07	0.03	125 μH	12 μH	1 to 2 MC	20 volts 200 ohms	
10Z4	3:1	0.07	0.03	160 μH	15 μH	1 to 2 MC	20 volts 100 ohms	
10Z6	4:1	0.1	0.04	200 μH	6 μH	1 to 2 MC	17 volts 100 ohms	
10Z12	1:1	0.25	0.02	200 μH	2 μH	12KC	100 volts	Blocking Oscillator
10Z13	1:1	0.33	0.07	240 μH	2 μH	2KC	50 volts	Blocking Oscillator
10Z14	7:1:1	0.50	0.05	1.2 mH	20 μH	1MC	25 volts	Impedance Matching
15Z1	3:1	5.0	0.04	7.5 mH	22 μH	10 KC	10 volts 100 ohms	Impedance Matching and Pulse Inversion
15Z2	2:1	0.5	0.07	6 mH	15 μH		40 volts	Blocking Oscillator
15Z3	5:1	10.0	0.04	12 mH	70 μH	10 KC	10 volts	Impedance Matching
15Z4	1:1.4	6.0	0.1	16 mH	15 μH	0.4 KC	15 volts	Blocking Oscillator
20Z1	5:5:1 Push-Pull	1.5	0.25	4.0 mH	0.3 MH		5 volts 10 ohms	Memory Core Current Driver
20Z3	6:1	1 to 4	0.22	18 mH	0.8 MH	250 KC (max.)	21 volts 200 ohms	Current Driver
20Z4	6:1:1	1 to 7	0.25	55 mH	0.3 MH	50 KC (max.)	22 volts 400 ohms	Current Driver and Pulse Inversion
20Z5	3.3:3.3:1 Push-Pull	2.4	0.2	2.8 mH	0.2 MH		2.5 volts 6 ohms	Memory Core Current Driver
20Z6	11:1	6.0	0.2	90 mH	0.2 MH	50 KC (max.)	10 volts 75 ohms	Current Transformer
40Z1	7:1:1	0.50	0.05	1.2 mH	20 μH	1 MC	25 volts	Impedance Matching

Sprague, on request, will provide you with complete application engineering service for optimum results in the use of pulse transformers.

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ducted. The film, "Operation Ivy," with a prologue by General Clarkson, exceeded all expectations and demonstrated the awesome power of the thermo-nuclear explosion of the first H-bomb, far surpassing anything any of the members had previously seen regarding the A-bomb.

Immediately following the film, General Clarkson resumed his talk and described the communications problems accompanying the operation just witnessed. With the aid of projected slides, he illustrated the system of communications and network employed to handle the vast volume of messages, mostly classified, resulting from Operation Ivy.

Southern California

Forty-six members of the Southern California Chapter made an all-day visit to the Navy Electronics Laboratory in San Diego on January 21st. Capt. Henry E. Bernstein, commanding officer and director of the Laboratory, was host for the occasion.

The morning's program consisted of a talk on "Human Factors in Equipment Design" by Dr. A. M. Small, head of the Human Factors Division; and a movie entitled "Time Compression."

Following lunch, the members were divided into three groups for a comprehensive tour of the Laboratory. The tour covered the following points of interest: model range, shops, sound lab, test huts; main lab, including supply system, SER projects, ASDEC, and transistor applications.

By the end of the day, the AFCEA group had acquired a practical knowledge of the mission of the Navy Electronics Laboratory. Specifically, this mission is to "conduct research, development, and tests, as authorized by the Bureau of Ships, in the field of electronics and the related fields of engineering and science, including radio, radar, sonar, oceanography, and the instrumentation for and analysis of environmental, weapons effect, and human factors; and provide consultative service and sea test facilities as authorized for the Fleet, for Navy contractors, and for other agencies of the Department of Defense."

Distinguished guest of the chapter for the occasion was General Omar N. Bradley, former Chairman of the Joint Chiefs of Staff, and now Chairman of the Board, Bulova Research and Development.

New officers elected at the annual meeting of the San Francisco Chapter on January 27th. Seated, left to right: Karel W. Goossens, secretary; Sydney N. Barton, first vice president; Chester L. Wickstrom, president; Thomas D. Razovich, second vice president. Standing, left to right: Frank L. Treadway, historian; Col. Ariel B. Cooper, director; and Lloyd C. Parsons, past president.

Southern Connecticut

Lt. Col. Oscar C. Buser, Chief of General Subjects Division (Tactics and Military Science), The Signal School, Fort Monmouth, and former Signal Officer of the 11th Airborne Division, was guest speaker at the chapter's January 20th meeting. Some forty members and guests were in attendance for his talk, demonstrated by the Army Air Force's film "D-Day Minus One" on the Normandy landings and selected slides, on some historical developments of airborne operations.

The only qualified paratrooper of field grade rank in the Signal Corps described the several types of airborne operations and the newer jumping and drop techniques, with emphasis on related aspects of communications. Colonel Buser was introduced by Col. Edgar Love, chapter president, who was his former commanding officer

Seattle Chapter's January 12th dinner-meeting. Seated, left to right: Bob Waters; William H. Arnold; Lt. Col. Elmer R. Higgins, chapter president; Oree Weller, Boeing Airplane Co., guest speakers; Warren J. Taylor, past president; Merrill R. Stiles, secretary; Lisle A. Hale and Karl W. Gunther. Standing, left to right: Dow I. Galloway, Lt. Col. Francis L. Leva; Joe E. Gregory; John D. Kroeger; Charles I. Shenefield; Merrill O. Peoples, trustee; Hershal D. Wandling, Jr.; program chairman; and Theodore W. Copeland, trustee. Photographer was Lee David, chapter treasurer.

Lt. Col. Ernest O. Bonham, chief, electronics division, Directorate of C&E, Hqs, ATRC, is shown addressing the January meeting of the Scott-St. Louis Chapter. "Future Trends in Air Traffic Control" was the subject of his talk.

when both were members of the New York National Guard during pre-World War II years.

The dinner-meeting took place at the Wonder Bar Restaurant in Bridgeport and was preceded by a social hour.

Tinker-Oklahoma City

The chapter celebrated the holiday season with a most enjoyable dinner-dance on December 10th. Held at the Officers' Mess, Tinker Air Force Base, the event was attended by more than one hundred members and guests.

Tokyo

The executive council of the chapter held a luncheon meeting on December 17th at the Sanno Hotel, Tokyo. General chapter business was conducted and plans were made for the next general meeting to be held on February 10th under Air Force sponsorship.

The vacancy in the position of chapter secretary has been filled by the appointment of Ensign Robert L. Scarborough, COMNAVFE.

Washington

In communications services—both military and civilian—the "mistakes of the development engineers are not sold to the customers" but remain the problem of the system operator, Deputy

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back
at

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man's
cruelest
enemy

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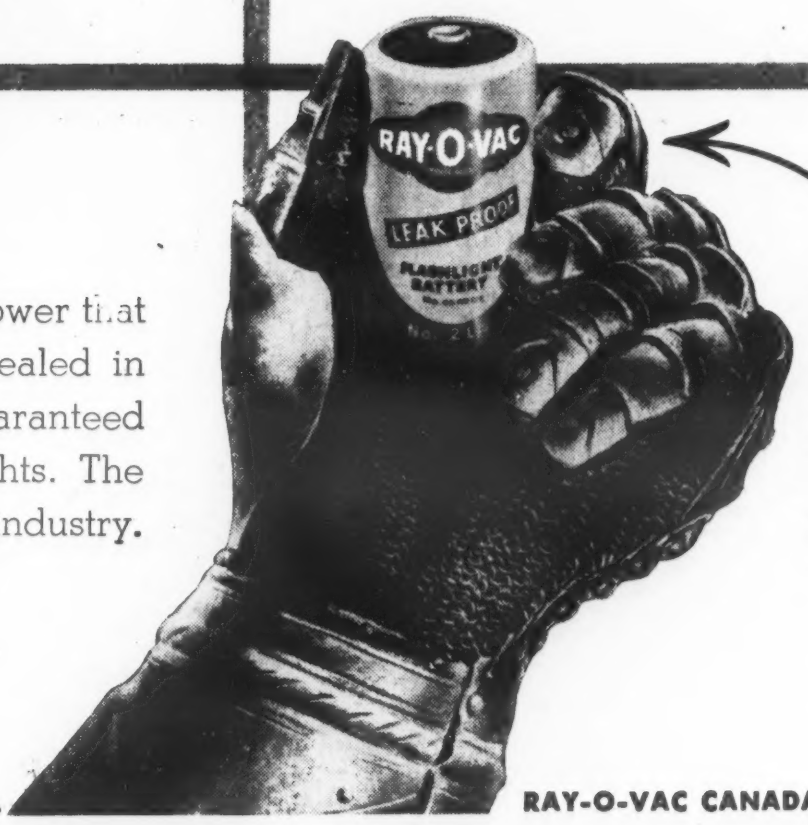

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Assistant Secretary of Defense W. H. Martin (Applications Engineering) told the chapter at its January 12th luncheon meeting at the National Press Club.

Describing problems of reliability of electronic equipment, Mr. Martin explained that the "crash" programs of World War II, postwar mobilization, and Korea resulted in compression of two normal decades of development into a few years, with the result that equipment was rushed into production without the usual evaluation.

Reliability, Mr. Martin stated, can and must be achieved, but may call for added initial costs and will require greater responsibility placed on the shoulders of the industry. It cannot be achieved, he declared, solely by "specification requirements and end-point inspection."

In industry, he said, management should insure that development engineers and designers have knowledge of what conditions the equipment will be subjected to, early knowledge of evaluation results, and data on behavior of the units under actual and simulated service conditions.

Dr. Mervin J. Kelly, president, Bell Telephone Laboratories, shown during his address on solid-state electronics before the February 2nd meeting of the Washington Chapter. At the right is Rear Adm. Frederick R. Furth, Director of Naval Research, who was program chairman of the meeting.

The February 2nd luncheon featured Dr. Mervin J. Kelly, president of the Bell Telephone Laboratories, as guest speaker. The following report on his talk appeared in *"Telecommunications Reports"*:

"With the great advances that have been recorded during the past seven years in this relatively new field, there is approaching a time of vastly greater use of solid-state electronics, Dr. Kelly told the Washington Chapter. Pointing to the fact that there already exist devices that will bring an 'evolution in ten or fifteen years to a great day in electronics,' Dr. Kelly said 'We are beginning a new cycle' of development in the field of electronics promising to far outdistance accomplishments recorded in the forty-five years of research devoted to the vacuum tube art.

"Among the many advantages to be found in the use of semi-conductors, Dr. Kelly cited the area of civilian communications which, he said, benefits, for example, from the reduced power consumption required by transistors and their associated components as compared with a vacuum tube, and from great savings in space because of the relative smallness of these new components.

"In long-distance communications, transmission over twenty-five miles, reduced requirements for amplification, and the greater capacity provided without adding to the amount of material used are among the advantages, he added. For communications over short distances, amplification is going to be made so cheap, Dr. Kelly said, that savings in copper and lead costs can be made by greater use of the circuits that the new devices can provide.

"Solid-state devices will also take over the functions now performed by electro-mechanical means in interconnections and do the job in a millionth of a second instead of thousandths with equipment that requires much less floor space than that now taken by electro-mechanical equipment, the Bell Labs President stated."

Student Chapters

Northeastern University

Division B, which was in school from November 21st to January 29th, conducted an excellent program of activity during the term. At its last meeting, new officers were elected to take office April 10th when the division returns to school. The officers are: president—Dennis Scolamiero; vice president—Robert Commito; secretary—L. Doucette; treasurer—G. H. Denoncourt.

The term's activities included trips to the New England Telephone and Telegraph Company, the Christian Science Monitor Building, and an inspection of the Boston fire alarm system. A combined meeting with Division A members featured a discussion and demonstration of high-fidelity audio and binaural sound equipment by representatives of the Radio Shack Corporation. Other meetings showed films on various subjects of interest to the group.

The chapter also sponsored a school play and attended the January 13th meeting of the Boston Chapter.

Plans for future activities include the organization of a chapter workshop and sponsorship of a contest among the university students interested in communications, electronics and photography in connection with a building fund for the new university lecture hall to be erected later in the year.

A diversified program featured Northeastern University Student Chapter activities this past term. Several of these activities are shown below. At left is an inspection trip to the Castle Island MARS station, and at right is a demonstration of Hi-Fi audio and binaural sound at a combined meeting of the Division A and B units of the chapter.

"Here come our ears!"

There are over fifty million telephones in this country today. Their service is so much taken for granted, it's hard to realize that there *are* situations in which voice communication is both vital and close to impossible.

Take a fighting army's advance post, for example. Helpless and practically useless without lines of communication to its base. The telephone equipment it uses must be light enough for a G.I.'s back, entirely self-powered (there are no electrical outlets in a foxhole!) and proof against all climatic conditions, including water.

The object floating in to shore, in the typical scene above, is a Signal Corps "SB-22" telephone switchboard, manufactured here at Stromberg-Carlson for the United States Army.

18 by 15 by 8 inches in size, it weighs just 32½ pounds. Included in this midget space are batteries capable of long hours' continuous use, a generator which can send a ringing signal over miles of field wire, cords and plugs tested to withstand the roughest use, all wrapped up in water-tight construction which makes the equipment as dunkproof as a fish!

To Stromberg-Carlson engineers, an achievement like this is everyday business—for industry, home and national defense. Whatever *your* interest is in the matter of communication and electronics, Stromberg-Carlson, with its 60 years experience in this specialized field, is ready to serve you.

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STROMBERG-CARLSON LEADS TOO IN:

"Panoramic Vision" Television Receivers

Radios and High Fidelity Radio-Phonographs

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ITEMS OF INTEREST

From Government, Industry and the Services

Transmissometer Installed at Andrews AFB

The Air Force's first operational transmissometer, an electronic instrument for accurately recording visibility, has been installed at Andrews Air Force Base, Maryland, with approximately 20 more bases in the U. S. programmed to receive the unit.

The instrument consists of a projector which directs a beam of light to a photoelectric detector. The intensity of this beam, when measured on a recorder in the weather station, indicates the amount of foreign material in the air in the form of dust, water vapor or precipitation of various sorts.

The receiver unit consists of a photoelectric cell and an amplifier. Transmitted light from the projector, which grows dimmer as the amount of foreign material in the air increases, is turned into an electric current by the photoelectric cell. Amplified and measured by a meter, the strength of this current gives an accurate evaluation of the visibility.

The indicator, which may be placed as far as 10 miles from the receiver unit, consists of an indicating unit and a recorder. A continuous record is kept on a paper roll by a stylus which is activated by the indicating unit.

When placed in the landing zones of airports, the transmissometer will materially increase the accuracy of visibility values given to incoming planes, and will be particularly effective under conditions of low or rapidly varying visibility.

New TV Tube Developed For Use in Naval Aircraft

A television tube, consisting of transparent flat plates, has been developed by Willys Motors, Inc., in connection with a long-range program for simplifying aircraft instruments, the Navy announced recently.

This program is expected to result in an instrument panel consisting of only two basic instruments. As now envisioned, one instrument would be a semi-circular plate mounted vertically and directly in front of the pilot. It would be transparent and thus would not interfere with the pilot's vision during contact flight.

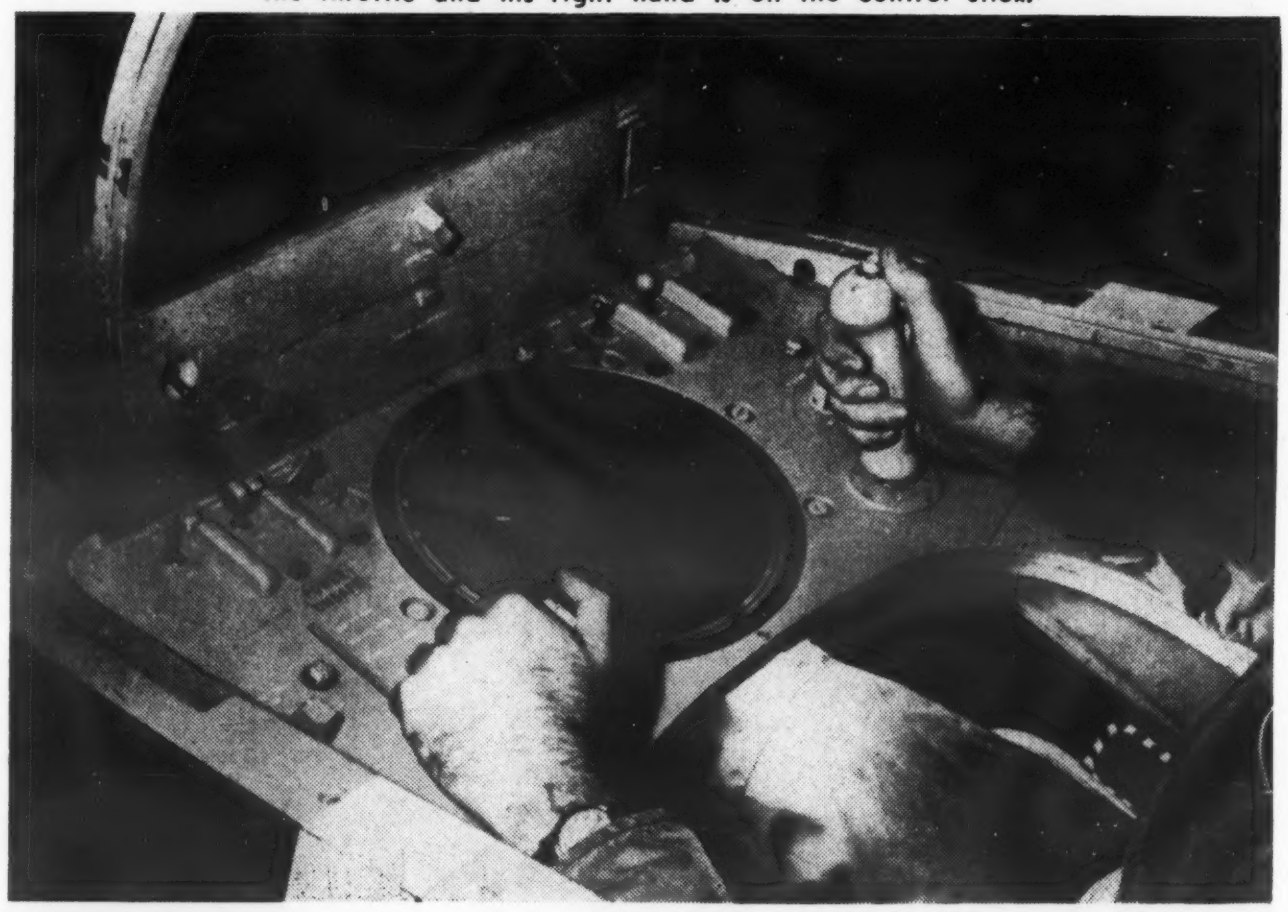
Altitude, speed and attitude of the aircraft would be shown on this plate, and physical features such as mountains, which the pilot sees during contact flight, would be depicted artifically.

The second instrument would consist of a round plate mounted below the first, just inside the cockpit rim. Broad physical features of the earth would be depicted by analogy, and the appearance would be somewhat similar to a radar map.

The new tube consists of a phosphor screen between glass plates. It is approximately 3 inches thick, as compared to the current standard television picture tube which has an average depth of approximately 20 inches, depending upon the area of the screen.

Powerful focusing action in the new tube makes possible a very small spot on the phosphor screen, which results in high definition and brightness because a large amount of beam current may be concentrated in a small area.

Pictured below is a mockup of an aircraft cockpit showing the new concept of instrumentation and controls. The two large instruments are flat-plate television tubes upon which information needed to fly the aircraft would be displayed. The pilot's left hand grasps the throttle and his right hand is on the control stick.



CBS TV to Present Air Force Story

"Conquest of the Air," the story of the growth of aviation and of the United States Air Force, will be presented in a Columbia Broadcasting System television network series beginning in the fall of 1955.

The new series of 26 weekly half-hour programs is being produced by CBS Television in cooperation with the U. S. Air Force. More than 150 million feet of film in all parts of the world—100 million owned by the Air Force—is available to the network to tell the story of flight from Kitty Hawk into the future.

"Conquest of the Air" will range from the first days of flight through two World Wars, the Berlin Airlift, Korea, Indo-China, and the intercontinental strategy of America's new Air Force. It will document the contributions of civilian and military airmen, ground teams and manufacturers in this country and of foreign civilian and military air power as well.

Each program in the series will be a complete unit in itself, covering one phase of the story of flight, and will be integrated with the basic theme of the series: the clear understanding of America's role in the air.

G-E Radar Cathode Ray Tube

A special "far-sighted, near-sighted" radar cathode ray tube, able another, was announced recently by to "see" farther in one direction than General Electric.

The tube was installed by G.E. in navigational radar sets now in use on Navy cargo vessels. With the sets, the ships can "see" 50 miles ahead and 30 miles behind. This gives them added forward "vision," instead of a 40-mile range in all directions, without requiring a larger tube and a more expensive radar set.

To make the tube, engineers at Electronics Park converted a standard 17-inch TV picture tube for radar by using a different phosphor screen and electron gun. They then bent the glass neck of the tube five degrees so its electron gun could give an off-center indication on the screen.

Existence of the unusual tube was disclosed in a new company booklet on special-purpose cathode ray tubes.

Armed Forces Day
May 21, 1955

"Power for Peace" has again been chosen by the Department of Defense as the slogan for Armed Forces Day this year. The same slogan, which best describes our Armed Services, was featured in 1953 and 1954.

The annual observance, held the third Saturday of May, is essentially an "open house" program, designed to promote public interest in an understanding of the Armed Forces. The public is invited to visit posts, camps, stations, bases, armories, reserve centers and other facilities in our national defense system.

As part of its support of Armed Forces Day, the AFCEA, which will be holding its 9th Annual Convention May 19-21 in New York City, will sponsor a trip to Fort Monmouth on May 21 so that the members may participate in the "open house" activities.

Reorganization Announced for Army R & D

Centralized control and direction of the Army's research and development programs have been made staff responsibilities of the Deputy Chief of Staff for Plans and Research, according to an announcement by the Department of the Army.

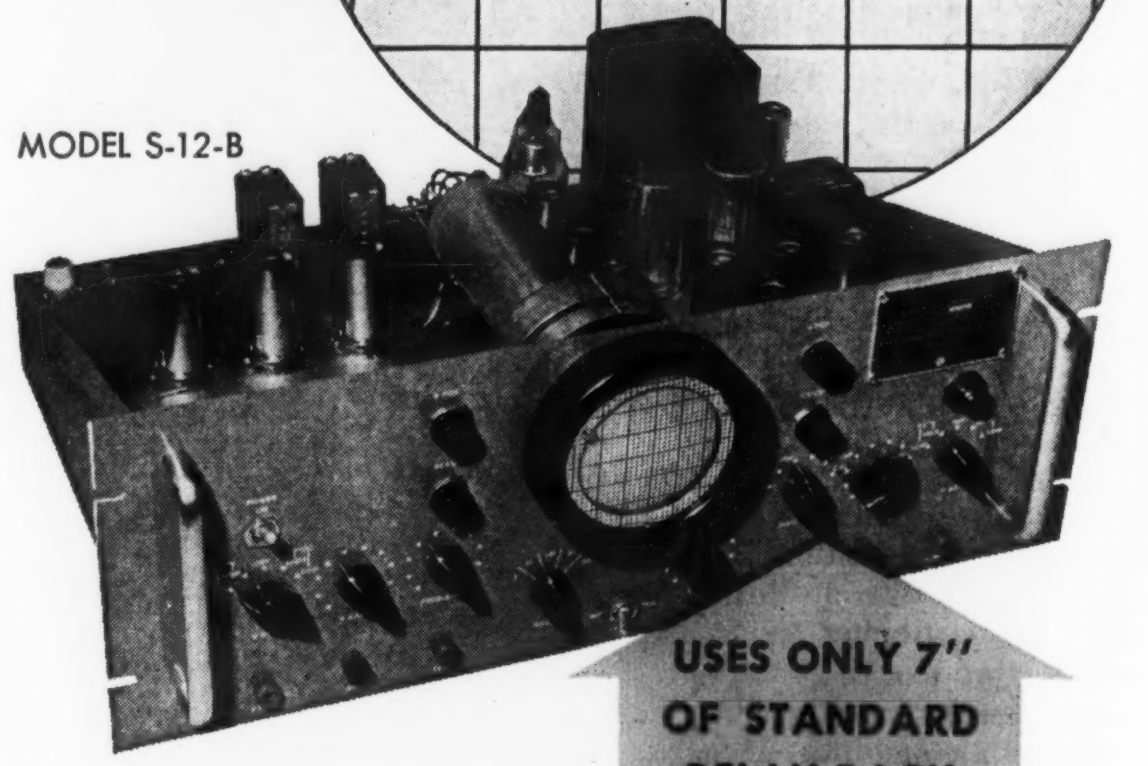
The reorganization of research and development responsibilities, expected to give added strength to the Army's efforts in this field, incorporates recommendations made by the Advisory Committee on Army Organization, scientists, industrialists and the Ad Hoc committee appointed by the Secretary of the Army to implement the Secretary's plan for Army organization.

Under the reorganization, General

(*Continued on page 62*)

JANized RAKSCOPE

by Waterman



ANOTHER EXAMPLE OF Waterman PIONEERING...

The S-12-B RAKSCOPE is a rack mounted, JANized (Gov't Model No. OS-11) version of the famous WATERMAN S-11-A POCKETSCOPE, with the addition of a triggered sweep and a special calibrating circuit for rapid frequency comparisons. The entire oscilloscope is built to occupy but seven inches when mounted in a standard relay rack. The vertical and horizontal amplifiers are identical, having sensitivities of 0.05 Volt rms/inch and frequency responses which are flat within —2 db from DC to 200 KC. These features permit observation of low frequency phenomena without undesirable trace bounce. The sweep rate is continuously variable from 5 cycles to 50 KC in either the triggered or repetitive mode with synchronization polarity optional. The return trace is blanked. Because provisions are made for applying input signals from the rear, as well as the front, the S-12-B is the ideal combination, systems monitor and trouble-shooting oscilloscope. Investigate the multiple applications of this instrument as an integral part of your "rack mounted" projects.

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S-14-A HIGH GAIN POCKETSCOPE
S-14-B WIDE BAND POCKETSCOPE
S-15-A TWIN TUBE POCKETSCOPE
RAYONIC® Cathode Ray Tubes and Other Associated Equipment

ITEMS OF INTEREST

Lyman L. Lemnitzer, Deputy Chief of Staff for Plans and Research, will assume responsibility for planning, general direction, and supervision of all Army research and development.

Director of the program within the Office of the Deputy Chief of Staff for Plans and Research will be Major General Kenner F. Hertford, Chief of Research and Development. The actual performance of research and development for Army weapons will continue in the Technical Services.

LEAR SUPERSONIC AUTOPILOT

Lear, Inc., Santa Monica, California, has recently announced a new autopilot designed for supersonic aircraft. Designated the L-10, it has been flown in several aircraft, including a jet fighter.

The amplifier of the L-10 provides approximately ten times more usable amplifier gain than the Lear F-5—the standard autopilot for the F-86D and the F84E for more than three years. The result is a very "tight" control-surface positioning loop. The new amplifier thereby brings control surface positioning accuracy well within the exacting tolerances required for supersonic flight.

Automatic omnirange navigation is possible on any radial heading selected by the pilot. The selected course is automatically maintained through coordinated turning of the airplane.

The L-10 Flight Control System is also designed to operate from guidance signals supplied by either ground or airborne airplane armament systems.

The tight control surface positioning loop available on the L-10 provides the high order of maneuvering accuracy required for tie-ins with weapons systems such as automatic fire control and automatic bombing.

New Carrier Equipped with Stromberg-Carlson Amplifiers

The Sound Equipment Division of the Stromberg-Carlson Company has announced that the *U. S. S. Forrestal*, the Navy's largest carrier recently christened at Newport News, is equipped with sixteen of the largest amplifiers ever built by Stromberg-Carlson.

The company designed and produced two separate amplifier systems for the *Forrestal*. One, for flight-deck announcing, employs seven large cabinets housing all controls and a battery of twelve amplifiers of unusually high capacity. This extra power is to assure that flight-deck announcements will be heard over the roar of jet planes.

The second system provides audio amplification for general announcing functions, and includes a control cabinet and four high-power amplifiers.

Stromberg-Carlson sound equipment will also be installed aboard the *Ranger* and the *Saratoga*, two other super carriers now under construction.

Miniature Gyro-Compass Ready for Fleet Use

The world's smallest nautical gyro-compass, light enough to be carried by Naval or civilian craft, has been developed by the Navy in cooperation with the Marine Division of the Sperry Gyroscope Company. It will permit small craft to navigate with direct reading true-north accuracy for the first time.

(*Continued on page* 64)

NATIONAL RESERVE PLAN PROPOSAL

The Department of Defense recently announced a proposed National Reserve Plan which would create a trained force of civilians available in case of emergency or mobilization.

In the event of mobilization, our forces would consist of the Ready Reserve, which would be immediately available, and the Standby Reserve. Both groups would contain men with military service obligations.

Ready Reservists would be subject to continued Reserve training activity, and would be subject to recall in the event of a national emergency *proclaimed by the President* or declared by the Congress.

Standby Reservists would be men who had completed stated periods of Reserve training requirements, or had spent sufficient time on active military duty. They would be subject to selective recall, but only in the event of a national emergency *declared by the Congress.*

Under the proposal, induction for military service would be continued, and young men would be subject to call upon reaching the age of 18½. All men entering the Armed Forces, whether through induction, enlistment or appointment, will assume a military obligation of eight or ten years.

Four Choices Available

Within the framework of this program, four choices would be available to all young men.

1. Enlistment in the regular component of one of the Armed Services for periods of three, four or six years. These men would incur an eight-year military service obligation, with time in both the Ready Reserve and the Standby Reserve.

2. Enlistment in the Reserve program of the Navy or Marine Corps, with the understanding that they will be called to serve a minimum of two years active service within 24 months of enlistment. The remainder of the eight year military service obligation would be in the Ready Reserve. Men must make this choice prior to reaching age 19.

3. Wait for induction, and assume an eight-year military service obligation beginning at whatever age inductees may be when called with two years on active duty and six years in the Ready Reserve.

4. Enlistment in a proposed additional program (to be offered by the Army, Marine Corps, and Coast Guard) which would require men to participate in a six-month training program, to be followed by 9½ years of military service obligation in the Ready Reserve. Choice of this program must be made while candidates are between the ages of 17 and 19.

All men, no matter what choice they select, would be subject to required participation in active Reserve training programs as long as they were classified in the new Ready Reserve.

Men who elect choices one, two or three would, while on active duty, receive regular military pay and qualify for existing veterans' benefits.

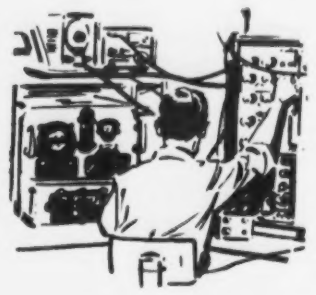
The Reserve training program for Ready Reservists would be intensified, and members of the Reserve, no matter what their service, would receive a day's military pay-in-rank for each paid training session attended, as well as pay for summer training.

Veterans who at present have obligated service time remaining would be expected to complete the remainder of their obligation through active Reserve service; they would not incur an additional obligation because of past Reserve inactivity.

A concise explanation of this proposed program is contained in a pamphlet issued by the Department of Defense entitled, "National Reserve Plan", which can be obtained from the Government Printing Office, Washington 25, D. C.

"Bogey at 30°"

Stewart-Warner Electric precision electronic instruments scramble the planes . . . track the targets . . . convert exact knowledge into *immediate action.* Stewart-Warner Electric produces a broad range of electronic equipment.



STEWART WARNER ELECTRIC

SW

Over 30 Years of Experience in Elec

RESEARCH • DEVELOPMENT •

STEWART-WARNER ELECTRIC •

Division of Stewart-Warner Corp. • 1300 North Kostner Avenue • Chic

ITEMS OF INTEREST

The Navy anticipates widespread use of the new instrument in the fleet, where it may replace the magnetic compass, which must be corrected at each reading to obtain true-north accuracy because of the earth's magnetic influence which varies at different latitudes.

Occupying less than one-half cubic foot of space, the nine-pound compass compares favorably in performance with present-day 900 pound master gyros which stand four feet high. It fits easily on a shelf close to the steering station, so that a steering repeater system is unnecessary.

Its extreme simplicity permits operation by personnel without specialized gyro-compass training, and its design simplifies easy replacement in the field of complete units or components as required.

Hughes and Airtron Announce Licensing Agreement

The signing of a manufacturing licensing agreement with the Hughes Aircraft Company of Culver City, California, was announced recently by Airtron, Inc. of Linden, New Jersey.

Under the new agreement, Airtron, one of the leading designers and producers of aircraft and electronic components, will manufacture microwave ferrite elements and ferrite-containing microwave devices such as ferrite attenuators, isolators, and modulators.

The agreement is expected to provide the basis for better service to the electronics industry with regard to microwave communications, commercial and military radar systems.

Airtron is one of the first companies to have negotiated such an arrangement with Hughes, which is numbered among the largest producers of electronic systems in the United States. The present agreement, which will be effective for ten years, also provides for mutual interchange of technical knowledge, processes, and experience.

New Radar Height-Finder from General Electric

A powerful new radar height-finder being made by the General Electric Company for the U. S. Air Force is helping to strengthen the defense networks of the United States and its allies.

G-E engineers say the radar's energy, concentrated in a narrow beam like that of a searchlight, detects planes three times as far as previous units of this type. Its exact range is classified.

The radar height-finder is being used together with search radar to detect high-flying aircraft and to provide information on distance, altitude and flight direction.

General Electric is making the new radar in mobile and fixed versions and has already supplied a large quantity for use in strengthening the radar fences guarding the North American continent, and for defense posts in countries receiving aid from the United States under the Mutual Defense Assistance Pact.

In Arctic climates the radar is housed in a dome-shaped circular structure with a balloon-like radome made of woven glass fabric impregnated with a rubber compound. The radome is supported by air pressure, about a half pound per square inch, and can withstand winds up to 125 miles per hour.

Engineers at the G-E Heavy Military Electronic Equipment Department, Syracuse, New York, and the Griffiss Air Force Base in Rome, New York, collaborated in the development of this radar equipment.

RCA Extends Microwave System To 2,450-2,700 Megacycle Band

An important extension of microwave radio service throughout the nation is foreseen with the announcement by the Radio Corporation of America of the first microwave system designed for operation in the unused 2,450 to 2,700 megacycle band of the microwave spectrum.

The new system opens up a completely new frequency band for microwave service and will permit establishment of new microwave stations in geographic areas already closed or crowded. In addition, the new RCA system has approximately half the spectrum requirements of most other systems, and will, therefore, permit even greater concentration of stations in a given region than heretofore possible.

This system provides up to 30 voice channels and is designed for the application requirements of utilities, pipeline operations, railroads, turnpikes, and commercial carriers.

Because of its frequency range, the equipment permits use of conventional triode electron tubes and standard circuitry which simplify installation, operation and maintenance.

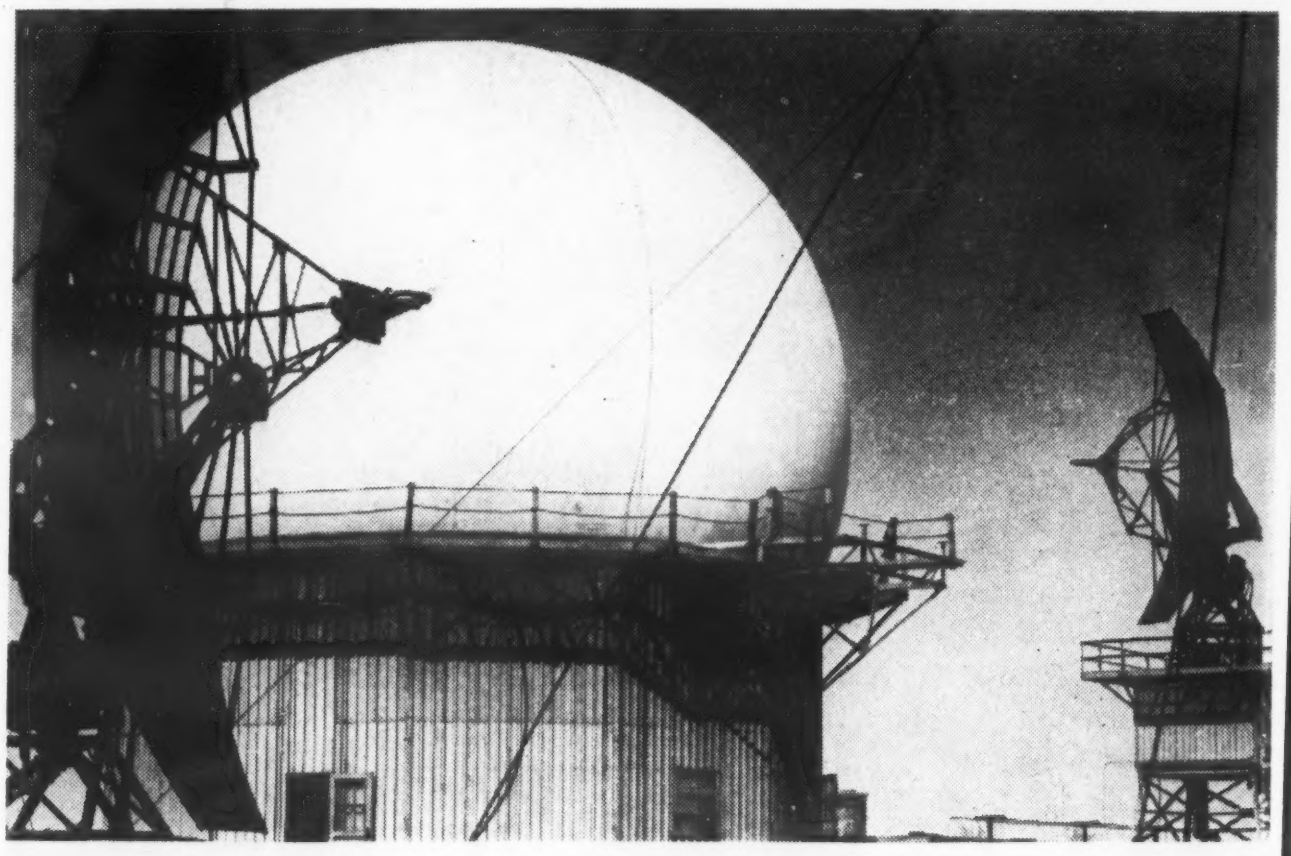
Nuclear Training Increased for U. S. Navy Personnel

With nuclear propulsion ready for practical application in the *U. S. S. Nautilus,* the Navy announced a stepped-up program to obtain increased numbers of officers trained in nuclear engineering and other phases of the nuclear power field.

Qualified Naval officers are invited to submit applications for postgraduate training in nuclear engineering for courses beginning in the summer of 1955.

Officers in the grade of lieutenant through commander are eligible for a 15-month course at the Massachusetts Institute of Technology, dealing with the design, development and construction of nuclear powered vessels. This course is primarily designed for officers with an engineering duty designation.

Three versions of a powerful radar height-finder made by General Electric at Syracuse, New York, for the U. S. Air Force. The unit at left is mobile. Radome structure, center, houses the radar in Arctic climates. Unit at right is for fixed installation in temperate areas.



Unrestricted line officers in the grades of lieutenant and lieutenant junior grade, will be enrolled at the Naval Postgraduate School at Monterey, California, for training as practical nuclear engineers for the operational maintenance of nuclear powered installations.

Distributors Appointed for Siemens Transistors

The Metropolitan Overseas Supply Corporation of New York City, manufacturers and distributors of electronic products, has been appointed distributor for the Siemens & Halske Aktiengesellschaft for the promotion of their line of contact transistors.

These point contact transistors are used to advantage whenever small physical size, low power and voltage requirements, or high shock strength, are important.

The amplifying transistor TS 13 lends itself principally to application in oscillators, amplifiers, telephone systems, special cases of broadcast and television engineering, and for small portable transmitters and receivers (MF range).

The switching transistor TS 33 is principally applicable to counter circuits, scalers, multivibrator circuits, pulse delay networks, computers and modulators.

First "Texas Tower" Ordered by Navy

The Department of the Navy recently announced the award of a contract to the Bethlehem Steel Company, Shipbuilding Division, Quincy, Massachusetts, for the fabrication and erection of one Off-Shore Radar Warning and Weather Data Collection and Reporting Station.

This is the first of several similar stations, known as Texas Towers, to be erected along the east coast of the United States for the Department of the Air Force by the Navy's Bureau of Yards and Docks, acting as construction agency.

This station, which is to be located approximately 100 miles off the New England coast, will cost between five and ten million dollars.

Home Warning Device Demonstrated to FCDA

The General Electric Company is experimenting with a small device that could be plugged into power outlets in homes to give an air raid warning alarm. The device was recently demonstrated to the Federal Civil Defense Administration.

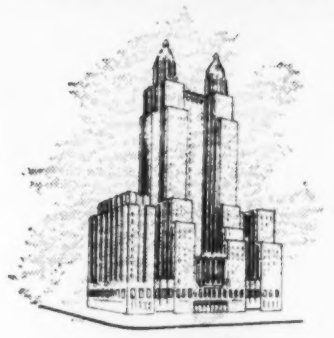
(*Continued on page 66*)

March 21-24

The Radio-Electronic of 1955!

See! Hear!

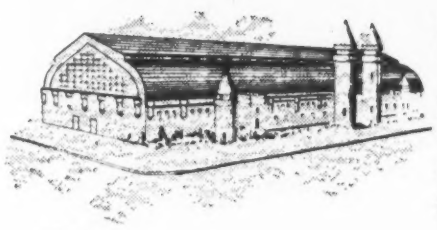
IRE National Convention



and

Radio Engineering Show

At both the Waldorf-Astoria (convention headquarters) and Kingsbridge Armory, you'll attend what actually amounts to 22 conventions fused into one. Hundreds of scientific and engineering papers will be presented during the many technical sessions, a large number of which are organized by I R E professional groups. You'll meet with the industry's leaders—enjoy the finest meeting and recreational facilities in New York.



At the Kingsbridge Armory and Kingsbridge Palace, you'll walk through a vast panorama of over 700 exhibits, displaying the latest and the newest in radio-electronics. You'll talk shop with the industry's top manufacturers—enjoy the conveniences provided for you in the world's finest exhibition halls, easily reached by subway and special bus service.

Admission by registration only. $1.00 for I R E members, $3.00 for non-members. Social events extra.

The Institute of Radio Engineers

1 East 79 Street, New York

ITEMS OF INTEREST

About the size of a small alarm clock, the new warning mechanism is described as a refinement of the low-voltage, 720-cycle carrier wave system long used by government agencies, cities and industries to turn off and on hot-water heaters, streetlights and similar utilities.

The carrier principle is the imposition of a voltage wave of a different frequency on 60-cycle powerlines. A special receiver reacts only to the imposed voltage which, in this case, would operate the warning devices.

The G-E receiver would remain plugged in a socket, and would sound in the home only if the transmitter for generating the carrier wave or warning signal were turned on at a central point. The receiver is technically capable of continuing to respond to warning signals even if electricity is cut off at power station switches.

FCDA said that chief obstacles to the use of the principle have been the cost of the receivers and adjustments in power systems to handle the signal. General Electric reports that the new receiver is expected to sell for between $5 and $10, compared with the present cost of about $30.

Together with the International Business Machines Corporation, General Electric is currently studying power systems in Albany and Buffalo, New York, and Bridgeport, Connecticut, to determine the cost of line adjustments required to use carrier currents for warning purposes.

Personnel

Bruton Succeeds Ammon As Director, Naval Communications

Rear Admiral William B. Ammon, Director of Naval Communications since 1952, has been succeeded in this post by Rear Admiral Henry C. Bruton.

Admiral Ammon was assigned to command of Battleship Division 2 in the Atlantic Fleet and reported to his new post at Norfolk, Virginia, on February 28.

In his new assignment, Admiral Ammon will be leaving the field of naval communications to which he has devoted a large part of his military career. Among his many assignments were assistant chief of staff for communications with the Pacific Fleet in 1947, and assistant director, Naval Communications in 1948-51.

Admiral Ammon is a national vice president of the Armed Forces Communications and Electronics Associa-

Rear Admiral Henry C. Bruton, USN

tion, also serving as a director and member of the executive committee of the Association.

With this new assignment, Admiral Bruton returns to the field of communications in which he served during the early part of his naval career after his graduation from the U. S. Naval Academy in 1926.

His assignments have included command of a task group at the Bikini atom bomb tests and commanding officer of the USS *Wisconsin* during the Korean war. Before being named to his new post, Admiral Bruton served as Deputy Chief of Naval Operations.

Moran and Hazen Take New Positions at Western Union

The Western Union Telegraph Company has recently announced the appointment of Fred E. Moran as Superintendent at Boston, Massachusetts, effective March 1st.

Before his transfer to Boston, Mr. Moran was Superintendent at Pittsburgh, where he was president of the Pittsburgh Chapter of the Armed Forces Communications and Electronics Association. Mr. Moran has long been an active member of the Association, having served as president of the Baltimore Chapter. He is at present a member of the Board of Directors of the AFCEA.

Also announced by Western Union was the appointment of Dan F. Hazen, Jr., as Superintendent at Cleveland, Ohio, effective Jan. 15.

Mr. Hazen, a member of the AFCEA, has served on Western Union's general office staff in New York in various supervisory capacities. Since 1951 he has been Traffic Manager at Philadelphia, the largest high-speed, pushbutton switching message center in the country.

General Back To Retire

As SIGNAL goes to press, news of the Presidential nomination of Maj. Gen. James D. O'Connell, Deputy Chief Signal Officer, to succeed Maj. Gen. George I. Back as Chief Signal Officer has just been released. General Back will retire from the Army on April 30th. Full details and biographical sketches will appear in the May-June issue.

Signal Corps Employee Wins Flemming Award

William R. Brown, Jr., U. S. Army Signal Corps employee, recently received the coveted Arthur S. Flemming Award, having been selected by the Junior Chamber of Commerce as one of the ten outstanding young men in Government.

The award was made as a result of Mr. Brown's work with the Army Signal Corps Pictorial Center, Long Island, New York, where he is Chief of the Information Films Section.

In producing the forum subject "George F. Kennan Discusses Communism," Mr. Brown released a subject credited with having great influence in orienting the Armed Forces to the real nature of the Red threat. This subject also won the Freedoms Foundation film award for 1953.

Any civilian, male officer or employee of the Executive Branch of the U. S. Government who had not reached his fortieth birthday prior to January 1, last year, was eligible for nomination in the 1954 Flemming Award program.

MARCONI GOLD MEDAL AWARD

Three members of the Armed Forces Communications and Electronics Association were among the 10 leaders of American government and industry who received the Marconi Memorial Gold Medal of Achievement.

The awards were presented at the 30th anniversary banquet of the Veteran Wireless Operators Association on February 19 in New York City.

Those members of the AFCEA who were honored were F. L. Henderson, executive vice president of the American Cable & Radio Corporation, New York, N. Y.; Eugene H. Rietzke, president of the Capitol Radio Engineering Institute, Washington, D. C.; and T. P. Wynkoop, president of the Radiomarine Corporation of America, New York, N. Y.

PERSONNEL CLEARING HOUSE

AFCEA Members Available to Industry

The pages of SIGNAL are open to active AFCEA members who are seeking positions in the communications, electronics and photographic industries. Any member is entitled to space free of charge in this column for three issues of the magazine. Please limit your notice to five lines. In replying, employers are asked to address: Box ——, SIGNAL, 1624 Eye Street, N. W., Washington 6, D. C. Letters will be forwarded to the AFCEA member.

MARINE CORPS VETERAN with B.E.E. degree desires position in systems design. Two years experience in plant testing and field installation of analog computers for naval fire control systems. Box 105.

CONTRACT ADMINISTRATOR. 8 years specialized, responsible experience in government procurement as former Section Head in Navy Dept. and with electronics manufacturer, handling contract administration, negotiations, quotations, redeterminations, renegotiation, etc. Box 106.

USAR SIGNAL CORPS MAJOR. Telecommunications specialist with 14 years military and civilian experience. Background also in personnel management, procurement and contracting. Fluent French linguist. Presently on mission in Europe. Seeks position as company's European technical representative or other responsible position in Europe, France preferably. Box 107.

RETIRING USCG LCDR, 30 years communications-electronics experience, operational and supervisory. Six years as instructor and CO of radio op school; 1st class FCC commercial license. Available 1 Feb. 1955; New England area preferred. Box 108.

RADIO-TV TECHNICAL DIRECTOR. Six years' experience in drama and music program direction. BA in Programming and production; technical background includes control room operations, equipment design, construction, maintenance. Age 26, married. Will complete tour as Microwave Instructor, The Signal School, June 1955. Prefer Chicago location, Box 109.

FORMER SIGNAL CORPS & CIC OFFICER. Age 35. Army, Air Force and civilian training and experience in personnel, labor relations, training, safety and security. College degrees supplemented by advanced training in foreign languages. Desires opportunity in export department, safety-security or personnel-industrial relations. Box 110.

SIGNAL CORPS PHOTOGRAPHIC OFFICER. Two years' experience as chief of Army type "A" lab in support of research and development. Former newspaper photographer. Technical knowledge plus strong journalistic background. Still specialist, some motion picture, audio-visuals. BS degree. Seek technical, publications, or sales position. Box 111.

COMMUNICTIONS EXECUTIVE (Engineering). 30 years' experience in commercial and military fixed plant systems both American and European. Senior Signal Corps officer. Widely varied background. Available in May, 1955. Box 112.

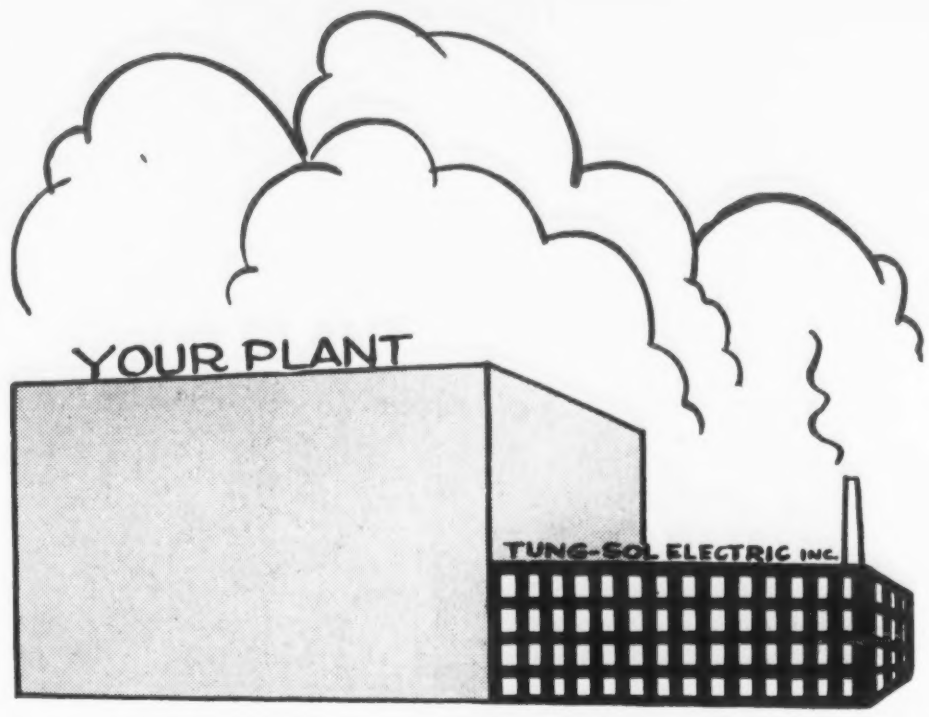
EIGHT YEARS' EXPERIENCE in transportation and communications. Background in public utilities financing, taxation, and personnel management. Education includes law degree. Box 113.

Government and Military Positions Available

Government and military agencies are invited to use this column to announce available positions which may be of interest to the readers of SIGNAL. Notices will be published three times if not cancelled before. Applicants apply as indicated in individual notices.

Applications are requested for electronic, aeronautical, mechanical, industrial engineering, editorial and photography positions located in the U. S. Naval Air Missile Test Center, Point Mugu, Port Hueneme, California. Applications, and requests for the complete Vacancy List of 39 available positions with salaries ranging from GS-5 to GS-13, should be addressed to: Mr. R. A. Riebow, Employment Superintendent, U. S. Naval Air Missile Test Center, Point Mugu, Port Hueneme, California.

THE SPECIAL DEVICES CENTER, Office of Naval Research, located 25 miles from New York City at Port Washington, Long Island, needs electronic and aeronautical engineers. Applicants must possess degrees in engineering, and pertinent electronic or aeronautical engineering experience. Apply to Mr. David A. Lana, Industrial Relations Dept., Special Devices Center, Office of Naval Research, Port Washington, N. Y.

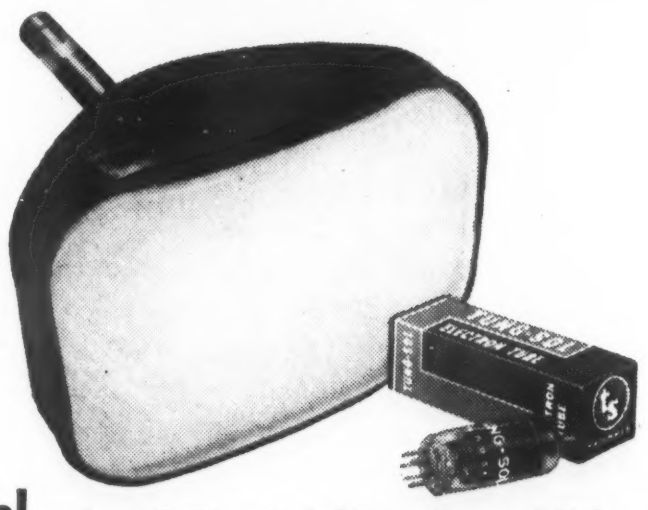


Our plant becomes an extension of your plant

Our engineering and manufacturing facilities can make our plant a vital extension of your plant. We make nothing but electron tubes—no sets—no equipment. We are completely independent, so we are in a position to keep your plans in strict confidence—to work with you with as much loyalty and secrecy as if we were in your own organization.

TUNG-SOL ELECTRIC INC.
Newark 4, N. J.

Sales offices: Atlanta, Chicago, Columbus, Culver City (Los Angeles), Dallas, Denver, Detroit, Newark, Seattle.



Tung-Sol makes All-Glass Sealed Beam Lamps, Miniature Lamps, Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes and Semiconductor Products.

NEW PRODUCTS from Industry

Paper Capacitors Simplify Circuit Assembly

The availability of subminiature paper capacitors in new styles that make vibration-proof mounting simple and harness wiring faster, has been announced by the Sprague Electric Company of North Adams, Massachusetts.

Straddle milled flats now machined on standard threaded neck units permit insertion of the neck into flatted openings, where it cannot rotate. A simple nut and lock washer then permanently lock the capacitor to the chassis.

In addition, Sprague subminiature paper capacitors can be obtained with solder tab terminals, eliminating the problem of splicing leads to wires.

Ratings and mechanical mounting styles for the capacitors far exceed those listed in specification MIL-C-25A. Both inserted tab and extended foil designs are obtainable at working voltage ratings up to 1000 vdc.

Motorola Transistorized Power Line Carrier

The first transistorized power line carrier to be placed in commercial production was recently announced by Motorola.

This new narrow band frequency shift apparatus utilizes transistors to achieve maximum reliability and continuity of service with a minimum of maintenance. The unique heretodyne transmitter and superheterodyne receiver provide transmission of high-speed information at the same close channel spacing of 500 cycles throughout the 40 kc to 200 kc band.

The receiver is completely transistorized and the transmitter uses transistors for all but the power output stage. Use of transistors provides a reduction in power consumption of up to 75%.

Because the transistorized equipment operates at reduced voltages and power temperatures, the life of all electrical components is extended. A unique push-pull circuit used in the transmitter power amplifier stage provides excellent reliability. Even with only one tube operating, satisfactory operation is obtained.

Frequency shift power line carrier is used to transmit telegraphic or other keyed type functions between

Pictured above is the prototype of a commercial x-ray microscope developed by the General Electric Company. Electrons are focused through 2 electrostatic lenses. The x-ray image obtained can be seen by the eye or photographed for further study.

stations on a power transmission line. It can be used for various methods of telemetering, load control, supervisory control, teleprinting, remote control and remote indication.

IRC Introduces New Power Resistors

International Resistance Company of Philadelphia is offering servicemen, through its distributors, two specially designed Resist-O-Cards introducing IRC's two new 7 watt and 10 watt wirewound power resistors.

Each of these cards provides a balanced assortment and is stamped with values included.

These resistors are of a unique rectangular shape with wirewound elements fully enclosed and sealed in ceramic, assuring long performance. Sturdy axial leads permit easier handling and installation.

Miniature Variable Capacitor for Transistor Receivers

A new miniature variable capacitor especially designed for transistorized radio receivers was announced recently by the Radio Condenser Company, Camden, N. J.

Smallest in the company's broad line of variable capacitors, the new unit is a direct result of transistor developments which make possible circuit design utilizing smaller tuning capacitances, and hence a reduction in tuning capacitor size. This miniaturization has been realized in Radio Condenser Company's new capacitor without sacrifice of stability or calibration accuracy.

The capacitor itself includes two variable sections, oscillator and radio frequency, both nested in a formed aluminum frame with trimmers on the bottom. The rotor shaft is available with pulleys, flats, knurls, or slots.

Presently available for application in all transistor type radio receivers, it can be further modified for automatic production if desired.

Du Mont Multi-Channel Waveform Monitor

Allen B. Du Mont Laboratories, Inc., Clifton, New Jersey, have announced a Multi-Channel Waveform Monitor capable of monitoring four video signals simultaneously on a single multiple gun type cathode-ray tube.

In a television station not originating color, for example, it will monitor the four outputs of a monochrome Multi-Scanner. In a station originating color programs, it will monitor simultaneously the three simultaneous color signals, and the encoded output of one color channel. Both input and output of an encoder may be monitored simultaneously.

An important feature of the equipment is the built-in calibrator. Operating a key on the panel connects a calibrating sine wave to all four channels simultaneously. The amplitude of the sine wave may be adjusted to any desired value and is regulated against line voltage changes.

Kodak Far Infrared Filters

A new series of infrared filters that will transmit out to 17 microns in the far infrared have been developed by the Industrial Photographic Division of the Eastman Kodak Company, Rochester, New York.

The new filters are constructed by optically polishing a plate of silver chloride and covering the polished plate with a smoke of silver sulfide. Spectral transmittance of the filters depends on how the silver sulfide is applied.

According to the manufacturer, it is an empirical process, involving a

ombination of spectrally selective catter and absorbence but it is laimed that the process is under full ontrol. The result is that a filter ith any specified specular transmit- ance may be produced.

The filters can be supplied in sizes rom ½ inch minimum to 5 inches aximum dimension, circular or rectangular (maximum length-to-width atio is 5:1). Up to 2½" the thickness is .040 inch; for 2½" to 5" the thickness is .085 inch.

The purchaser may designate any of nine equally spaced shortwave length cut-offs from 1 micron to 5 microns and the manufacturer will supply it within a tolerance of ± .2 microns.

Miniature Variable Resistor from Stackpole

A low-cost variable resistor only ⅝ inches in diameter, yet rated for a wide variety of commercial and military applications, is now available in production quantities from the Electronic Components Division of Stackpole Carbon Company, St. Marys, Pennsylvania.

The new Stackpole Type F Control is especially suited for installation in chassis where space is limited, as in midget portable radios, television receivers, audio equipment, instruments, and compact printed circuits of all kinds.

Using the standard Stackpole deposited carbon resistance element and gold plated ring spring contractor, the Type F control gives unusually quiet and stable operation even under wide humidity variations.

Wollensak 8mm Cine Lens

A 1½" f/2.8 Cine Raptar Telephoto lens in focusing mount with a new, exclusive orienting brake is the latest addition to the Wollensak line of 8mm Cine Raptars.

This high-speed lens has a focusing range from 1½" to infinity. Like all Wollensak Cine Raptars the 1½" f/2.8 is supplied complete with drop-in, coated, optical glass haze filter.

The lens orienting brake feature eliminates the necessity of loosening screws to rotate the lens for proper indexing on the camera. If the indexing marks appear on the bottom of the lens, the lens can be removed, the ring on the lens mount thread pressed in, and the lens rotated to the proper position. When the lens is replaced on the camera, the indexing marks are in a new position. The brake automatically locks when the lens is screwed into the lens seat.

Kay Lab Computer Reference Power Supply

A new Computer Reference Power Supply for use with analog computers has been designed by Kay Lab of San Diego, California.

This new unit, known as model 127D-20, provides two output voltages of ± 100 volts and a current of 2 amps on each output. The significant advantage of this power supply over others previously commercially available is that both outputs are maintained within ± .02% of their absolute voltage value, and both outputs are inter-referenced to ± .01%.

The long time stability of the unit is in excess of 100 parts per million, and the short time stability in excess of 50 parts per million.

Dynamic characteristics provide an output ripple and noise of less than one millivolt and an output impedance for DC of less than .01 ohm and for AC to 200 kc of less than 0.5 ohm. The line regulation factor for ± 10% change is ± .01%.

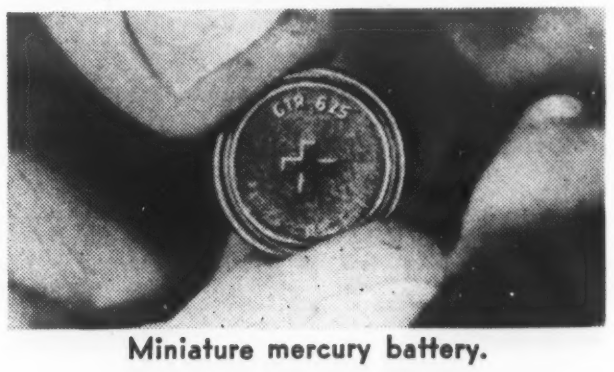
Miniature Mercury Battery

A new miniature mercury battery with an unusually high rating for constant current, power, and service life has been developed for use in electronic equipment by General Dry Batteries, Inc., of Cleveland, Ohio.

Called the "General 625," the battery measures .225 inch in height and .065 inch in diameter, and weighs 4.5 grams.

When used in transistor-operated hearing aids, the new battery provides as much as 150 more milliampere hours output and up to 60 per cent more service on a cost-per-service-hour basis than any other mercury cell of comparable size.

The battery satisfies the need for a reliable and economical low-drain power source for many types of electronic equipment. Among possibilities are use in electronic testing devices, including meters, transistor oscillators and sound-measuring instruments; circuits, including audio, bias voltage, voltage reference, relay and switching; communications, including transistor radio and hearing aids; and other equipment such as digital computers and radiation detection instruments.



Miniature mercury battery.

Fleetwood Television Projector

To meet the need for equipment with which to project a television image on a screen large enough to be viewed by several hundred people, The Fleetwood Corporation of Toledo, Ohio, has announced its model FL-1001 Television Projector.

Capable of projecting a clear, bright, well defined picture up to 9 feet by 12 feet, this new mobile piece of equipment can be used in individual classrooms for special groups, in large auditoriums, as well as for sales demonstrations and closed circuit conferences.

The FL-1001 is completely self-contained in a heavy-duty metal cabinet, and is equipped to receive a television signal direct from network lines.

Power supplies, amplifiers, and video units are mounted on sliding racks, offering immediate accessibility for service. Overall size of the unit is 24" wide, 36" deep, and 48" high, weighing 400 pounds.

Bogue Electric Announces Junction Transistor

A general purpose N-P-N grown junction transistor is now available in quantity from Bogue Electric Manufacturing Company of Paterson, N. J.

This transistor is intended for applications at power, audio and radio frequencies up to 1,000 kilocycles. It is particularly adaptable for use in control and switching devices and is capable of power gains up to 32 decibels. Since this Bogue transistor is hermetically sealed it is impervious to moisture and possesses good temperature characteristics.

Ebert Electronic Relay

The ever-increasing industrial need for a low-cost, reliable and extremely sensitive control instrument has led to the design of the new Ebert Micrelay for control of high power, high current loads up to 60 Amperes or 3 Hp. from very low current, low power devices or circuits.

The Ebert Electronics Corp. of Queens Village, New York, recently announced this newest addition to its line of switching relays. Typical Micrelay activating devices are: photo-cells, thermostats, meter-type contacts, and circuits controlled by resistivity of fluids and capacitance of dielectrics.

(*Continued on page* 70)

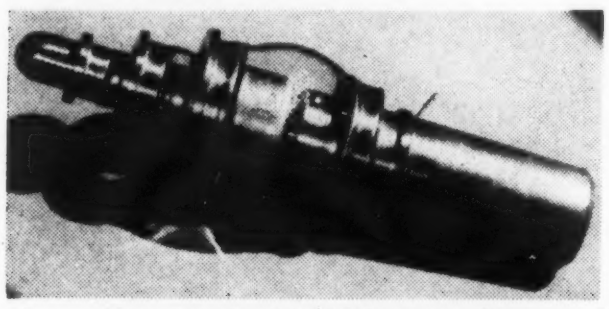
NEW PRODUCTS

The Micrelay is a simple, rugged and compact electronically controlled unit, completely A.C. operated. No rectifiers or sensitive armature-type relays with their inherent limitations are employed. Built-in power line isolation permits full flexibility of external control circuitry.

There are no exposed contacts or mechanical moving parts in the entire Micrelay unit since the relay's mercury-to-mercury operation is completely enclosed in an hermetically sealed tube, permitting safe operation even in explosive atmospheres.

Coaxial Triodes from Machlett

Machlett Laboratories, Springdale, Connecticut, has announced the production of ML-6420 and ML-6421 coaxial-terminal triodes, employing thoriated-tungsten filaments, for industrial and broadcast equipments of 5-10 kw power output.



Shown above is the Machlett coaxial-terminal triode with thoriated-tungsten filament.

The new triodes provide improved performance ratings, safety margins and strength. New thoriated-tungsten filaments greatly reduce power requirements while offering life increases to 100%. Plate and grid current ratings are increased by better than 10%; terminal inductances are very low; high transconductance characteristics assure stable operation, low grid drive and high plate efficiency.

Incorporating a rugged, coaxial terminal structure, heavy-wall anode, self-supporting thoriated-tungsten filament and large, ring-seal connections, each of these heavy duty triodes will give excellent performance and low-cost service.

Levinthal I-F Transformers

Levinthal Electronic Products, Inc., Redwood City, California, has announced a new line of Intermediate-Frequency Transformers capable of meeting the difficult electrical and environmental requirements of instrumentation, missile, and aircraft applications.

Electrically, the double-permeability-tuned units feature unusually constant inductance, free from non-linear effects; and a wide tuning range, as well as high resistance to moisture and chemical attack. Their operating temperature range is from —50 C to +100 C, with a coefficient of inductance less than 50 ppm/°C.

Housed in 1⅛" cubical cans, the standard units are supplied with zero internal coupling, although specified coupling can be supplied on special order. The voltage rating is 400 volts maximum.

Hansen Tape Resistors for Experimental Layouts

Hansen Electronics Company of Los Angeles, California, has announced the development of type RTW Tape Resistors designed for experimental work in building prototype assemblies of modular design.

Since the metal terminals may be soldered to a wafer such as is used in Project Tinkertoy, with the circuit pattern fired thereon, type RTW Tape Resistors may be used in experimental assemblies and tested without the necessity of curing new resistors on a plate each time a resistor is changed.

After the final circuit values have been determined, it is recommended that the tape be applied directly on the wafer. Type RTW Resistor is ½" long by 0.110" to 0.150" maximum width and is available in resistances from 39 ohms to 4.7 megohms.

Type RNP is recommended for application in miniaturization where it is unnecessary or impractical to use a ceramic baseplate. Type RNP precured tape resistors have an overall length of 1.3", with 0.4" leads and are available in resistances from 100 ohms to 1 megohm, with tolerance of ±5% and ±10%.

Miniature Broad Band R.F. Coaxial Switch

A new addition to its line of miniature broad band R.F. coaxial switches was announced recently by Transco Products, Inc., of Los Angeles, California.

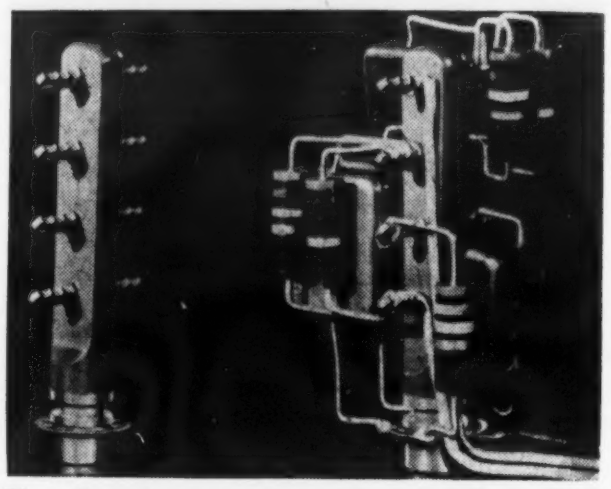
The unit is 12 ounces in weight, and occupies only 3"x 3½"x 2½" of space, thus providing unusual latitude in designing with coaxial switches.

Switch models are available with two R.F. circuit combinations. The new SP4T unit has an actuator power rating of 18-30 VDC at 0.18 amps. maximum per coil. Ambient operating temperature range is —65°F to +225°F—actuating time: 10 milliseconds. Life duration is 500,000 operations minimum.

Component Mounting Post from Sangamo

A new component mounting post called the Tote-m-pole has been developed by Sangamo Electric Company, Springfield, Illinois, to improve the "bug resistance" of model and production wiring in government and industrial gear.

It provides ideal mounting support for small components such as resistors, capacitors, diodes and transistors at their operating point. Critical leads to grid suppressor resistors, for example, can be reduced to pigtails.



The Sangamo component mounting post, shown above, provides ideal mounting support for small components such as resistors, capacitors, diodes and transistor.

This device assists the engineer to get near optimum component density and point-to-point wiring. Fewer leads, cables and soldered joints are necessary. Ventilation of parts mounted with this wiring aid is excellent. A Melamine pole gives low tracking, heat-resistant properties.

The Tote-m-pole mounts with a single chassis drill hole. It can be reused many times for model mock-up or component replacement. It is adapted to jig wiring practices whether the jig is of cardboard for design study or a production type.

Magnetic Voltage Regulators

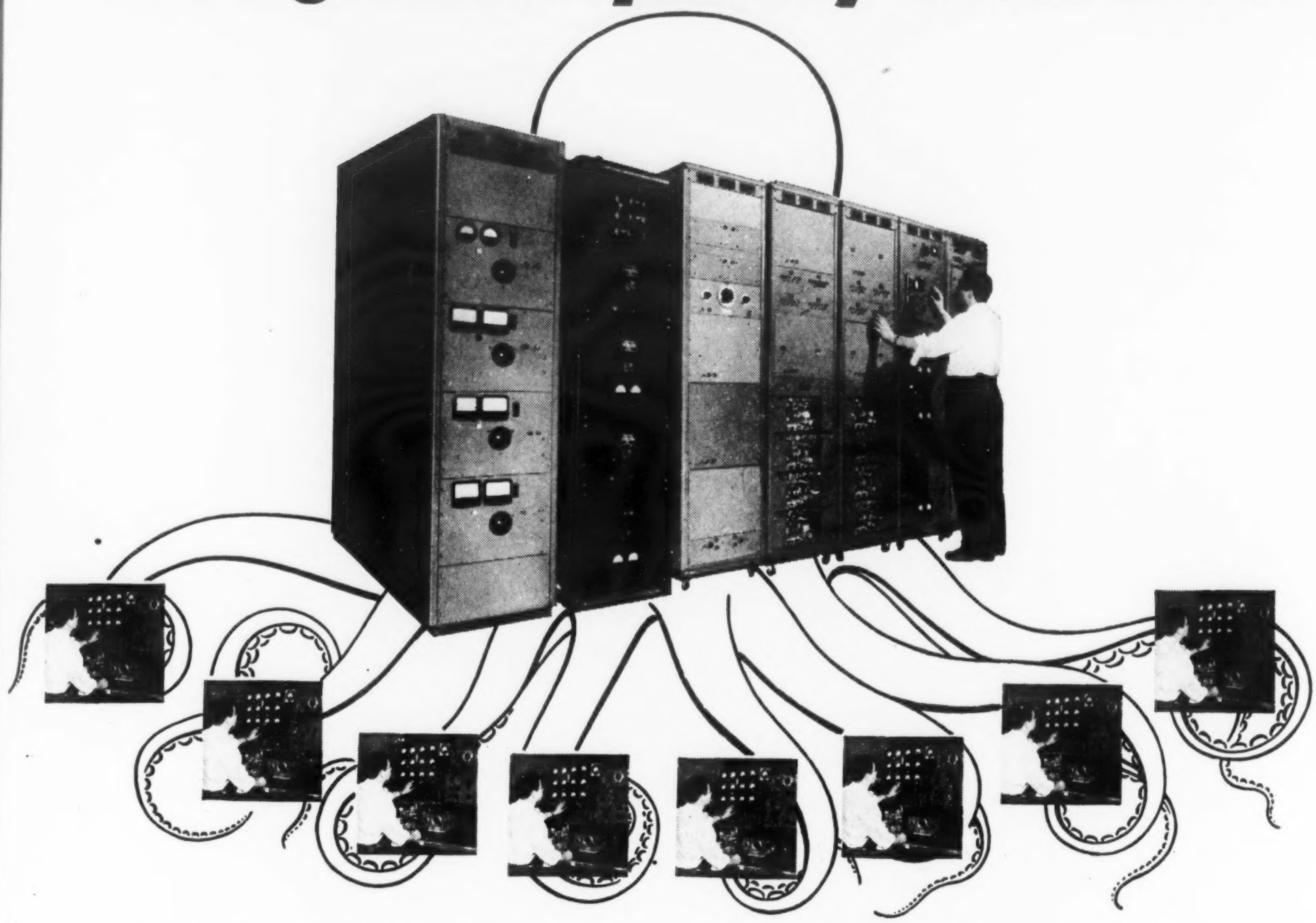
Sorensen & Co., Inc., now have available the first four models of what will be an extensive line of magnetic voltage regulators, or regulating transformers.

The units have capacities of 15, 30, 60, and 120 VA. Soon to be added will be units of 250, 500, and 1000 VA capacities. They are primarily intended for incorporation into other equipment, where performance becomes more effective when the incoming line voltage is stabilized. They can, however, be used as auxiliary line stabilizers.

These voltage regulators have an input voltage range of 95-130 VAC, single phase and output range of 115 VAC, RMS, single phase.

(*Continued on page* 72)

$120,000 "OCTOPUS" safeguards quality at LEWYT!



WHEN Lewyt built this unique centralized control system, its many "tentacles" earned it the name "octopus."

Actually it is a series of standards which supply 45 test positions at different stages on Lewyt's production line with regulated voltages and various frequencies for testing Lewyt-made GRC series receivers and receiver-transmitters.

This insures:

1. A uniform yardstick for testing, which eliminates human error.

2. Identical test conditions for Company and Government inspectors, doing away with time-consuming comparison of results at different test positions.

3. A minimum of maintenance problems.

In spite of the system's complexity, Lewyt engineers so designed it that it is amazingly flexible and easy to operate. For example, standby equipment for emergency replacement is built right into the main distribution panel. It also has a built-in oscilloscope with patch cords for quick systems monitoring. And, all sub-assemblies are of the plug-in type—in case of failure a spare can be substituted in a matter of seconds!

This is just one more way Lewyt versatility safeguards quality and keeps costs down on all Lewyt-made equipment.

Lewyt has been a Government Contractor in both war and peace since 1914. It keeps 1,800 trained workers on its assembly-lines at all times, busy in peace, ready in emergencies.

LEWYT

Manufacturer of Electronic and Electro-Mechanical Equipment Since 1888

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NEW PRODUCTS

Polarized Relay from Kurman

A polarized relay utilizing a permaloy armature with anti-chatter contacts is now being manufactured by Kurman Electric Company, Inc. of Long Island City, New York.

The armature is equipped with extra heavy palladium copper contacts. The contact screws have 1/16" diameter tungsten contacts rated at 2 amp. 110 VDC.

The Kurman P255A relay, ideal for use in teletypewriter applications, consists of a coil with two parallel windings of 136 ohms each. The relay is mounted through a Western Electric #18B connecting block and is insulated from the mounting plate.

New Type of Electrical Connector from Rodale

The Rodale Manufacturing Company of Emmaus, Pennsylvania, is now introducing an entirely new principle in UL-approved electrical connectors.

This new line of products, called "Flip Seal," is a series of waterproof, dustproof, fully protected electrical connectors in ten different blade arrangements. A flexible rubber lip has been incorporated over the socket component of the connector which flips over the plug component to insure a positive sealing and locking type action.

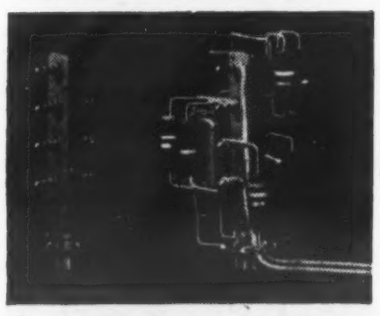
At both ends of the connector the cable entrances are also provided with a sealing action wherein the cable entrances fit tightly around the wire. The connector components are molded of rugged phenolic, and completely encased in a rubber or Neoprene housing, asuring that the unit will withstand severe punishment in any application.

for that short grid lead

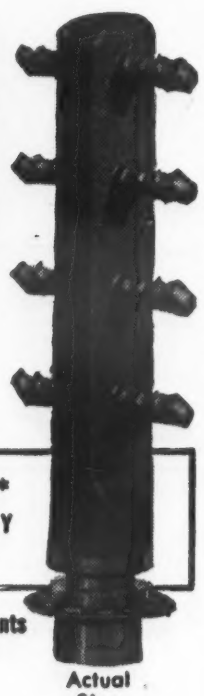
use the Sangamo

Tote-m-pole

First used in Navy electronic gear, Tote-m-poles are invaluable for "bug-resistant" wiring of models and production units. Advantages: Short leads; high component density; improved ventilation.



Tote-m-pole supporting "T" network of 5 resistors and 4 capacitors.



Actual Size

CUSTOM COMPONENTS SEC.*
SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

*H. V. Power Supplies • Inductive Components
Servo Instruments • Low-X Resistors

Pictured above is the Beckman and Whitley sweep image camera, known as the Synchronized Streak Camera. The unit has a sweep rate of 4.56mm per microsecond and a sweep duration of 44 microseconds. It is used to study explosions and similar phenomena.

New Hermetic Seals Withstand Severe Temperatures and Pressures

Advanced Vacuum Products Inc. of Stamford, Connecticut, a division of General Ceramics Corporation, recently announced production of their new line of "Advac" seals.

The Advac metalizing process makes it possible to produce hermetic seals capable of withstanding higher temperatures and severe thermal shock. These super-rugged seals are the result of the integration of the metal coating into the ceramic itself. "Wedding" the two materials furnishes a bond for the soldering or brazing of metal parts.

Custom seals are fabricated for special requirements. Advac seals can be inside or outside diameter and butt seals. Various metals are used to meet the conditions of different environments.

Beckman & Whitley Sweep Image Camera

Details of a new research camera system using synchronized-streak techniques to produce a writing speed of 5.46mm per microsecond and a sweep duration of 44 microseconds have been released by Beckman and Whitley Inc., San Carlos, Calif.

Known as the Synchronized Streak Camera Model 168, the camera may be used to study transient events such as explosions, flash-tube, shock-wave and other phenomena.

Used to record those events which can be synchronized with the camera mirror angle, this position-vs-time synchronized sweeping image recorder is of the type sometimes referred to as a smear camera.

In use, the model 168 camera plots on film the progress of an event against rectangular coordinates where the vertical axis represents space and the horizontal axis represents time. This technique is effective not only with self-luminous events, but also schlieren and interferometric effects. At maximum operating speed (50,000 rpm) the standard unit has a sweep rate of 5.46mm per microsecond, and an elapsed time of 44 microseconds for the image to sweep the film.

Raytheon "Fathometer"

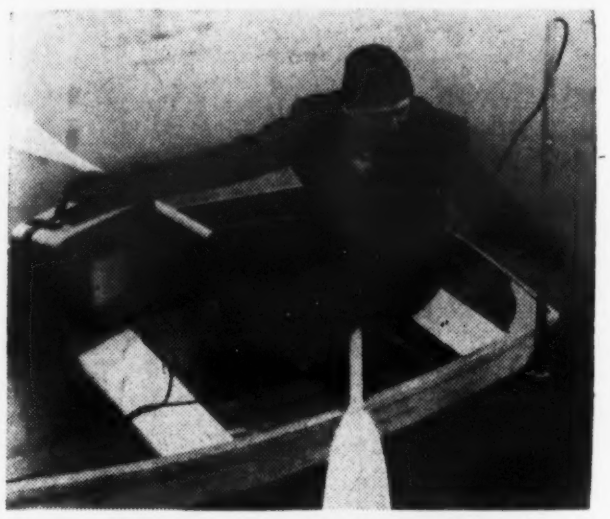
A new electronic depth sounder, so small that it can be carried in a rowboat for charting the bottoms of lakes, river, and shoal waters, was recently announced by Raytheon Manufacturing Company, of Waltham, Mass.

Designated the DE 119, the "Fathometer" weighs only 140 pounds and is powered by a standard, six-volt storage battery which will operate the equipment for eight hours. On the face of its metal case, a glass window reveals the chart paper, which can be operated at three speeds: 12, 30, or 60 inches per hour.

The instrument is highly accurate over its entire range from zero to 240 feet of depth, readable in four phases. The first phase covers a depth from zero to 60 feet; the second goes down to 120 feet; the third from 120 to 180 feet, and the fourth phase from 180 to 240 feet.

NEW PRODUCTS

The transducer, which generates the ultrasonic signal and "listens" for its echo, is lowered over the side on the end of a short pipe. It is held a foot or two below the surface of the water. The sound signal travels through the water until it strikes the bottom, then returns in the form of an echo. The transducer picks up the echo, and the equipment automatically converts the time interval into a reading of feet or fathoms.



Shown above is the "Fathometer," developed by Raytheon. This echo depth sounder is the world's smallest portable electronic device for charting the depth of rivers, lakes, and shoal waters.

Fairchild Polaroid Camera

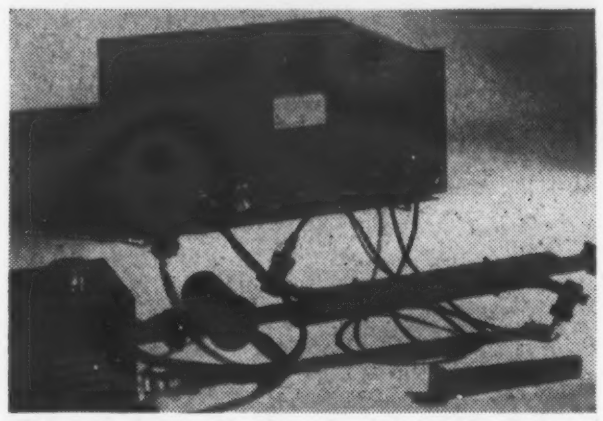
A newly designed identification camera, utilizing the Polaroid "print-a-minute principle" and applicable to industrial security and institutional use, has been announced by the Fairchild Camera and Instrument Corp., Syosset, Long Island, N. Y.

The camera is interchangeable on the 35mm Graflex Photo Record ID stand, where an 84mm lens camera is presently used. Conversely, this 35mm Graflex camera can be used on the Fairchild Polaroid ID Camera assembly. A special, high quality electronic flash unit is also provided.

The equipment includes a mounting and lighting system plus a positioning bar for accurate focus. The equipment is highly portable, and can be quickly set up anywhere for photographing groups, without the necessity of their leaving their jobs for long periods. The camera is equipped with a Wollensak 90mm anastigmat lens of f/3.5 aperture, designed to provide exceptionally high quality prints.

X-Band VSWR Measuring System

Retaining the speed and high accuracy of earlier models, a new model 110B X-Band VSWR Measuring System with an added attenuation scale and new VSWR scales reading from 1.02 to 1.20 and 1.1 to 2.50 has been developed by Color Television Incorporated, San Carlos, California.



Pictured here is the model 110B X-Band VSWR Measuring System, developed by Color Television Inc. of San Carlos, California. A high percentage of accuracy makes it ideal for laboratory work.

The system includes a tunable oscillator permitting complete and continuous coverage from 8500 to 9600 mc, an accurate wavemeter to supplement the direct-reading dial of the oscillator, a bi-directional coupler with bolometer detectors for incident and reflected power, and a direct-reading VSWR indicator.

Employing a ratiometer type of indicator, the CTI system is truly "direct-reading," as no adjusting or zero-setting is necessary when the oscillator is tuned through the X-band or the load is changed.

The overall accuracy of the system —better than 2%—makes it ideal for laboratory measurements. The accuracy is maintained throughout the frequency range because of the matched characteristics of the bi-directional coupler arms and integral bolometer mounts.

New Literature from Industry

New Catalog Available From General Transistor

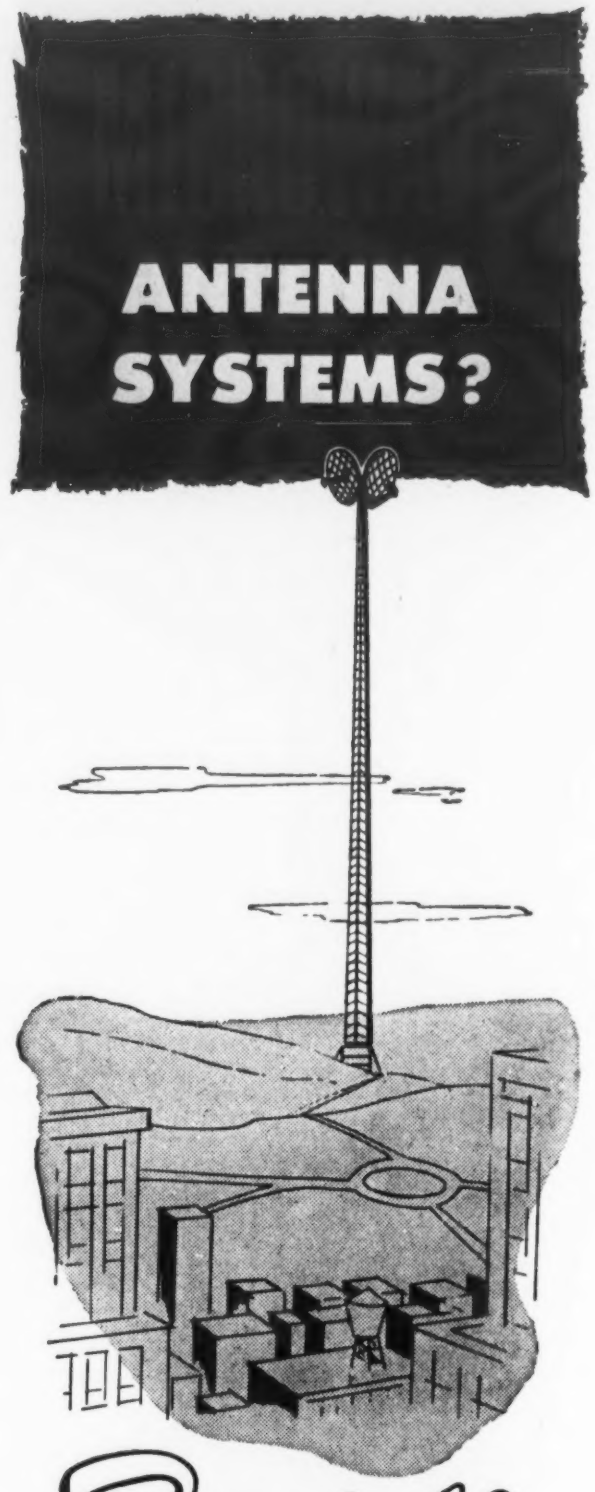
General Transistor Corporation of Jamaica, New York, manufacturers of transistors and related semi-conductor products, including germanium diodes, has just released their new catalog of diffused p-n-p junction transistors.

This new bulletin, available for the asking, illustrates General Transistor's double sealing process—encapsulated in plastic and hermetically sealed in a can. It also includes absolute maximum transistor ratings and characteristics.

American Lava Issues New Bulletin

American Lava Corporation of Chattanooga, Tennessee, has recently announced the publication of its newest bulletin, "AlSiMag L-5 High Frequency Electrical Insulators."

(*Continued on page 76, col. 3*)



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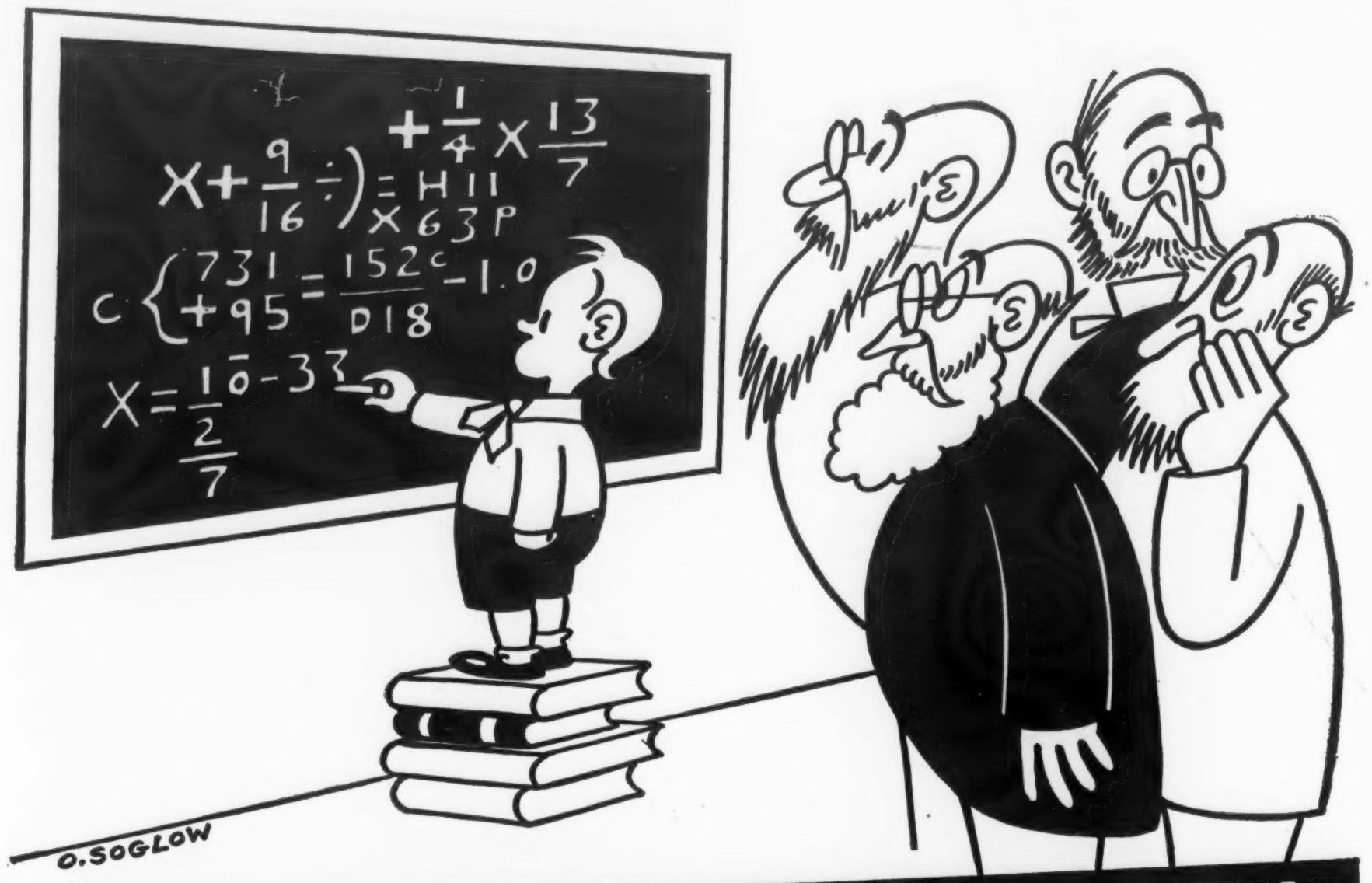

You'll be surprised at these figures!

Thanks to the thrift of employed Americans and the cooperation of 45,000 companies which have enrolled more than 8,000,000 men and women in the Payroll Savings Plan—

● Sales of E and H Bonds (H Bond is the current-income companion piece of the E Bond, sold only to individuals and purchased in larger denominations by executives) in 1954 totaled $4.9 billion, a new peacetime record.

● Sales in 1954 exceeded *all redemptions* in that year of matured E Bonds and unmatured E and H Bonds by more than $400 million—the highest net amount since 1949.

● Cash value of E and H Bonds outstanding reached a new record high of $38.2 billion, a gain of $1.5 billion in 1954.

● This $38.2 billion cash holding by individuals represents 14% of the national debt. Never before has the national debt of our country been so widely held.

These figures, far more effectively than mere words, tell the story of The Payroll Savings Plan—why it is good for America, why it is good for business. If you do not have the Plan, or if you have the Plan and your employee percentage is less than 50%, phone, wire or write to Savings Bond Division, U. S. Treasury Department, Washington, D. C.

The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

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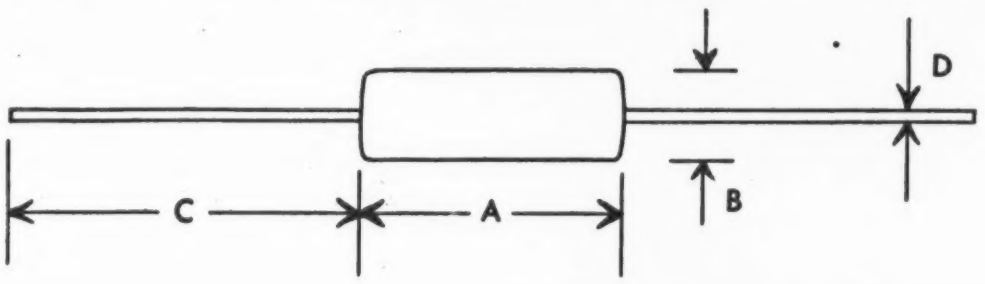
NOW

1/8, 1/4 and 1/2 watt *Molded* Precistors

IRC *molded* Deposited and Boron Carbon Precistors are now available in 1/8, 1/4 and 1/2 watt sizes. These 1% precision film type resistors combine the advantages of high stability, small size and low cost in either deposited carbon or boron carbon units. Ratings are based on full load at 70°C. ambient.

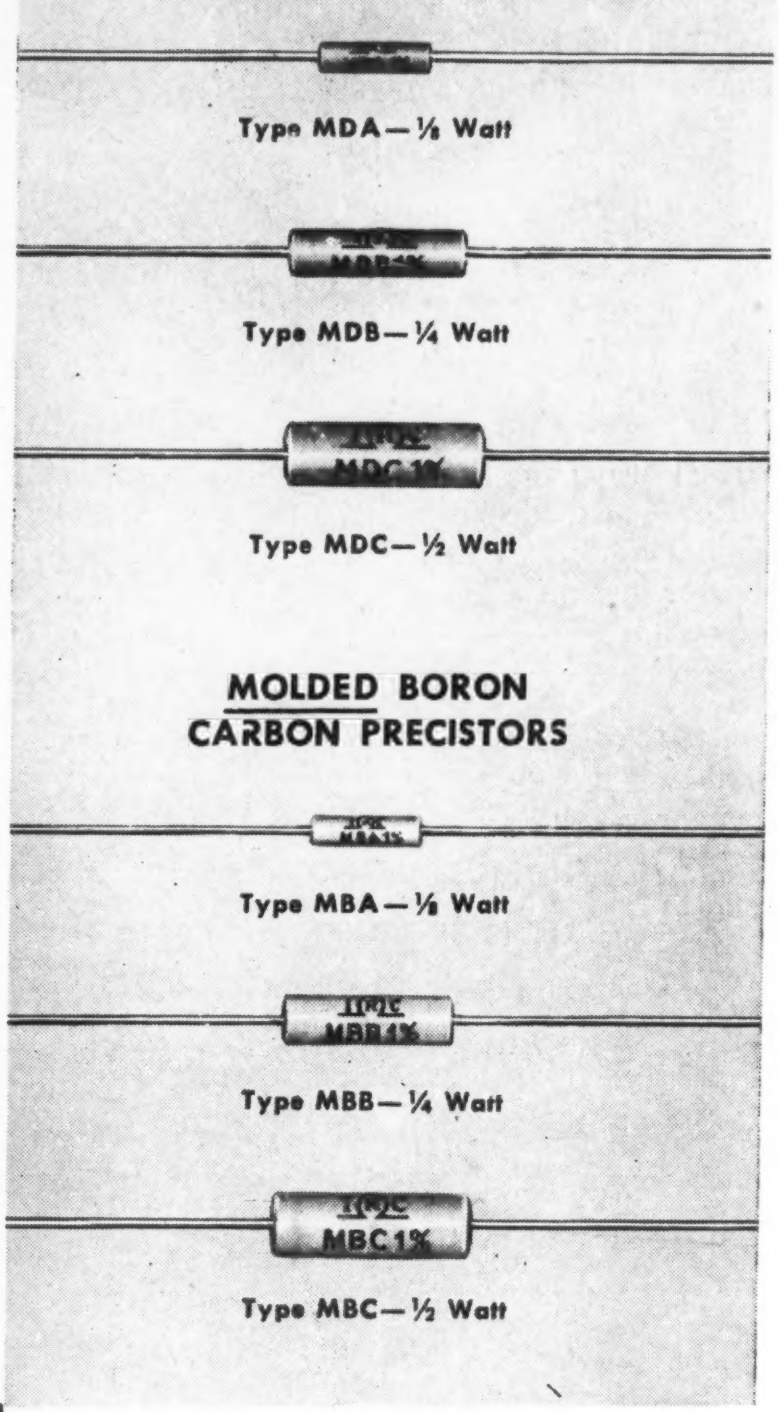
The *molded* plastic housing provides complete mechanical protection, minimizes the effect of moisture and improves load life characteristics.

Equivalent In Size To IRC's Popular Types BTS • BW½ • BTA



Precistor Types	IRC Size Equivalent	Dimension			
		A	B	C	D
MDA — MBA	BTS	13/32"	1/8"	1½"	.032"
MDB — MBB	BW½	5/8"	3/16"	1½"	.032"
MDC — MBC	BTA	23/32"	1/4"	1½"	.040"

MOLDED DEPOSITED CARBON PRECISTORS



Type MDA—1/8 Watt

Type MDB—1/4 Watt

Type MDC—1/2 Watt

MOLDED BORON CARBON PRECISTORS

Type MBA—1/8 Watt

Type MBB—1/4 Watt

Type MBC—1/2 Watt

Precision Wire Wounds • Ultra HF and Hi-Voltage Resistors • Low Value Capacitors • Selenium Rectifiers • Insulated Chokes • and Hermetic Sealing Terminals

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*City*_____ *State*_____

Communications Maintenance for the "Beltline"

(*Continued from page* 32)

perform the mission. After experience was gained by actual equipment operation, necessary adjustments were made in the program.

It is interesting to note that in practically all cases these initial programs eventually proved that the equipment was being over-maintained. A typical example of this excessive amount of preventive maintenance was discovered in the Plan 51.3A semi-automatic teletype switching center. There are more than three hundred major units of equipment involved in this one facility alone. The maintenance program demanded detailed stripping and cleaning each of these components every thirty days. Even so occasional breakdowns were experienced. When the work load began to become excessive for the assigned personnel, a decision was made to take a calculated risk and actually determine how long the machines would operate without breakdown with only a minimum amount of routine oiling and visual inspection. It was somewhat surprising to discover that these machines not only operated continuously for a ninety-day period without major breakdown, but that there were fewer component failures and maladjustments than on the few machines retained on a thirty-day maintenance schedule. Upon detailed stripping of these equipments, they were found to require no more maintenance than the ones which remained on a thirty-day maintenance program. Consequently the schedule was revised from a thirty to a ninety-day period; thus it has remained. This same principle had been employed as nearly as possible in respect to the electronics gear.

Problem of Tampering

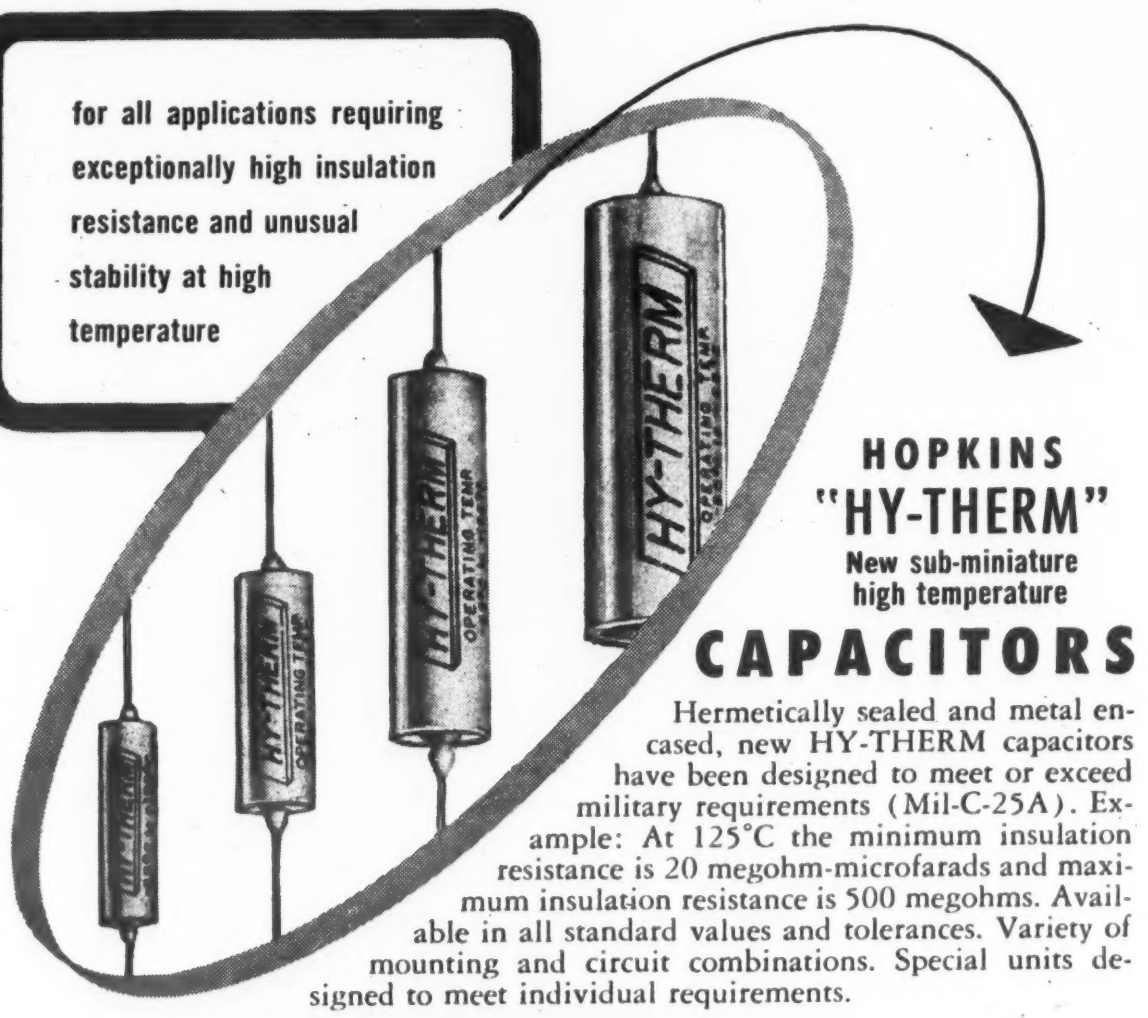
One of the most exasperating problems was what is termed "tinkeritis." This was discovered to be one of the major faults of the maintenance personnel, especially with regard to the terminal equipment located in the communication relay center. Efforts to analyze the problem led to this belief that this unsatisfactory situation existed principally because the majority of the electronics maintenance personnel were unfamiliar with the characteristics of the equipment they were dealing with, and had had insufficient training to enable them to cope with an unfamiliar situation when actual or suspected equipment malfunctions occurred. A solution to the problem was possible with the establishment of a hard and fast rule —*Do not tamper with the equipment so long as it appears to be operating properly unless you know exactly what you are doing.* Since operations requirements demanded twenty-four hours a day, seven days a week facility attendance, there were bound to be some deviations from this rule, and to a certain extent, such deviations still exist, since qualified personnel cannot be made constantly available. The only method of combating this weakness was, and is, the inauguration of an intensive on-the-job training program for all assigned maintenance personnel.

The plant superintendent at each of the facilities was given the widest possible latitude in making his own decision as to the frequency of scheduled routine. Therefore, at each of the three facilities, variations in schedules are found. No work of any type is performed on any of the equipment by maintenance technicians unless they have been issued a work order, recorded on a standard form, by the flight supervisor.

The maintenance records are maintained on card forms which are retained in cardex holders and mounted on an open table type rack. A set of

(*Continued on next page*)

for all applications requiring exceptionally high insulation resistance and unusual stability at high temperature



HOPKINS
"HY-THERM"
New sub-miniature high temperature
CAPACITORS

Hermetically sealed and metal encased, new HY-THERM capacitors have been designed to meet or exceed military requirements (Mil-C-25A). Example: At 125°C the minimum insulation resistance is 20 megohm-microfarads and maximum insulation resistance is 500 megohms. Available in all standard values and tolerances. Variety of mounting and circuit combinations. Special units designed to meet individual requirements.

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HOPKINS Engineering Co.

2082 Lincoln Ave., Altadena, Calif., SYcamore 8-1185 • Offices in WASHINGTON, D.C. and DETROIT

Catalog available

NEW PRODUCTS

(*Continued from page* 73)

The introduction on the inside front cover gives a detailed explanation of what the JAN-1-8 specification numbers mean and how to locate them in the bulletin.

•AlSiMag is the registered trade name of a large family of technical ceramic compositions.

RF Interference Filter Catalog Available

A new 22-page combined catalog, recently announced by Filtron Company, Inc., of Flushing, New York, reviews the company's complete standard line of Type FSR interference suppression filters for use in screen rooms, induction heating equipment, diathermy and x-ray units or similar equipment.

Detailed information on each filter is given, by means of cutaway views, dimension drawings and descriptive text. Complete engineering data on every unit permit the user to select and specify the right filter for a particular application.

Communications Maintenance for the "Beltline"

(*Continued from preceding page*)

these records, consisting of title and component cards, is prepared for every complete item or functional group of equipment. Only flight supervisors are permitted to maintain or change the equipment record cards.

The maintenance procedures outlined above have proven effective in maintaining equipment of the Andrews Gateway facilities. They can be attested to by the ever decreasing circuit outage time attributable to component failure. Of the total circuit outage time at this station, only five percent of it is charged to equipment failures and malfunctions. By far, the greater portion of this time could be traced to power failures.

The emergency power plants at each of the facilities are designed for continuous operation in the event of commercial power failure. They also have the capability of synchronizing and paralleling with the commercial power whenever they are placed on the line. Therefore the power maintenance personnel must be proficient not only in maintaining the units, but also in the operation of complex controls and distribution switch gear. Improper operation of the switch gear would cause numerous power outages and resultant equipment failures. The importance of preventing this may be realized by the fact that a one-minute power outage costs approximately $500.00 in delay of operational traffic alone. Therefore an interruption during the transfer from primary to standby power can hardly be tolerated.

The final analysis of the maintenance program as practiced at this station is based on one word — coordination. The key-note of the entire procedure has been to let the left hand know at all times what the right hand is doing. In case of any doubt there is a clear and concise procedure published, which will guide and direct all personnel concerned toward the ultimate desired goal. That goal is the operation of a trouble free station so far as maintenance activities are concerned. At that time the trouble tickets may be thrown away.

- - - — - —

convention

CONVENTION

CONVENTION

Ferrites

(*Continued from page* 15)

megacycles in about 1.5 seconds, making practical the presentation of network transmission characteristics (r-f amplitude versus frequency) on a cathode-ray tube. A ferrite modulator unit in this equipment provides amplitude control to within plus or minus 0.1 db over this frequency band and also provides amplitude modulation of the swept c-w source. By using ferrites, too, that Branch has also developed a microwave magnetometer capable of detecting magnetic field changes of a small fraction of an oersted.

On the basis of their accomplishments to date, NRL scientists are confident that ferrites can be used instead of such microwave components as TR's, ATR's, modulators, switches, attenuators, phase shifters, matching sections, and polarization changers, to name a few. These new components should also be more rugged and reliable than their predecessors. They are encouraged in their confidence by the fact that commercial devices are now available which use some of the design principles developed at the Naval Research Laboratory.

- - - — - —

Self-Regulation

(*Continued from page* 27)

iarize themselves with the Commission's Rules, it is more than likely that these individuals, who are radio operators only as an adjunct to their normal occupation, do not appreciate the necessity for strict observance of operating rules and procedures. To promote an orderly communication system which will operate with a minimum of interference and time on the air, the licensee should establish a suitable operating procedure designed to accomplish these objectives and make certain, through adequate supervision, that the operators are familiar with pertinent law, rules and standards, and adhere to the established procedure.

There are so many things that users can do in the interest of self-regulation that time will not permit me to go into them. But of this you can be certain. None will be easily achieved. In fact, I am satisfied that the few steps which I have suggested will meet with a certain amount of resistance. No doubt there are those of you who are not in accord with what I have said. That's quite alright. That is your privilege. I'd far rather have you disagree with me than not have an opinion.

What I have tried to do here is to alert you, and anyone else who may read my remarks, to the seriousness of the problem. For, I know that if the manufacturer, the dealer, and the user awake to the necessity for self-regulation, eventually something will be done about it. And I am not too concerned as to whether or not what is done is in line with what I have suggested so long as you consider the matter and eventually arrive at a solution. For that, of course, is the sole purpose of this talk.

- - - — - —

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TRANSISTOR AUDIO AMPLIFIERS. Richard F. Shea. John Wiley & Sons, Inc., New York, N. Y. 219 pages, $6.50.

The primary purpose of this book is to provide the practical fundamentals of transistor applications and to show how these fundamentals may be used in the construction of audio amplifiers.

The author has kept his treatment general, and applicable to the great majority of specifications which are available from transistor manufacturers. Methods of representation have been chosen which seem most likely to be generally accepted, with conversion tables for the adaption of other representations.

The various methods of coupling transistor stages together are analyzed. A number of examples are given of the design of amplifiers intended for a variety of applications, ranging from pre-amplifiers to relatively high-powered output amplifiers.

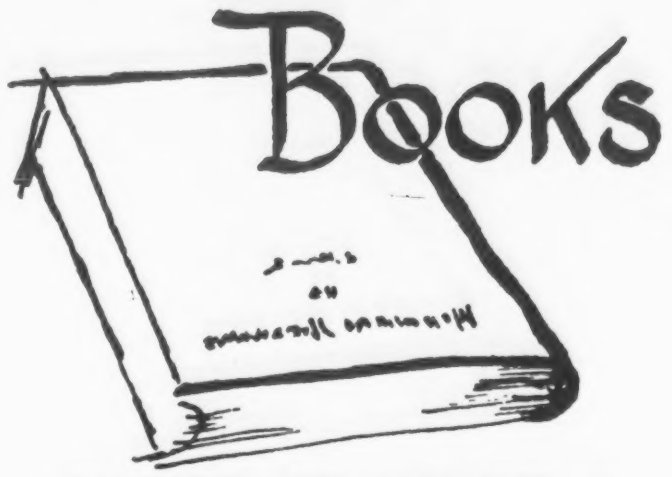
This material will provide the user with the necessary tools whereby he can design an audio amplifier to meet the prerequisites of frequency response, signal-to-noise ratio, input power, and output power in such a manner as to insure maximum reproductions, longest life and lowest cost.

STORAGE BATTERIES, 4th Edition. By George Wood Vinal. John Wiley & Sons, Inc., New York, N. Y. 446 pages, $10.00.

Reflecting the many technological advances in battery design and construction that have taken place during the past fourteen years, the new fourth edition of *Storage Batteries* has been largely rewritten to bring the reader up to date.

The book emphasizes the scientific principles of storage batteries without allowing the treatment to become too highly technical. Physical and chemical properties of the materials employed in making batteries are discussed, and the reader is given a general description of manufacturing processes.

Important industrial applications are described, including telephone service, railway signaling, car lighting, and air conditioning, automotive starting on passenger cars, Diesel starting, batteries on shipboard and air plane batteries.



TELEVISION FOR RADIOMEN. Revised Edition. By Edward M. Noll. The MacMillan Company, New York, N. Y. 778 pages, $10.00.

This book is a complete, thorough and up-to-date study of television for radio servicemen, practical electronic technicians in either plant or field work, the radio amateur and experimenter, and the technical school student.

New chapters on UHF, color television, and transistors have been added to this edition, plus a complete modernization of other chapters. Cascode tuners, new video amplifier techniques, large screen picture tubes, modern deflection systems, and the latest antenna data are all adequately discussed.

Assuming a basic understanding of radio circuits, the author explains the principles and essential mathematics of television in the clearest, most practical terms. Following the explanation of fundamental theories, he describes each part of modern television equipment, showing the particular application of theory to both construction and operation.

The information on commercial equipment is completely up-to-date and, although devoted mainly to receiver practice, also covers transmission. The book therefore serves as a basis for those who want to progress into transmitter studies or television engineering, in addition to being a complete guide for the television technician and serviceman.

Our Book Department can furnish any book currently in print. We will also help to secure older copies that you may need to complete your library. A 10% discount allowed all Association members on orders of $10 or more. Please indicate author and publisher where known and allow three weeks for delivery.

THE GYROSCOPE APPLIED. By K. I. T. Richardson. The Philosophical Library, New York, N. Y. 384 pages. $15.00.

As a result of the technical advances made under the impetus of two world wars, there are few engineers who are not aware that the gyroscope plays an important part in the navigation and control of ships and aircraft, in gunfire control, bomb sights and the torpedo.

This book, based on *The Gyroscope and Its Applications* written in 1946, explains the theory of the gyroscope and describes its practical application.

Unlike the first book which was written by several authors, this is the work of one man, who is closely associated with the development of many forms of gyroscopic application in many different spheres. It is believed to be one of the few books that covers as many of the different types of application as possible ranging from small intricate aircraft instruments to large engineering projects.

The fundamental mathematical treatment of the subject has been removed to the appendix where it has been collected in a convenient form.

INTRODUCTION TO UHF CIRCUITS AND COMPONENTS. By Milton S. Kiver. D. Van Nostrand Company, Inc., New York, N. Y. 408 pages, $7.50.

The rapid growth of television has put increasingly greater emphasis on the understanding and practice of UHF.

To meet that demand this comprehensive guide contains a thorough coverage of circuits and components of greatest concern to those charged with the production, maintenance and installation of UHF equipment. It covers all the component problems relating to the generation, transmission, radiation and reception of UHF signals.

There are discussions of UHF television, microwave relay stations, UHF receivers and transmitters, traveling wave tubes, klystrons and magnetrons. UHF antennas and measurements are also covered with emphasis on practical applications.

All technicians, students and amateurs, as well as professional engineers interested in UHF, will find this book a valuable reference.

SPECIAL "EXHIBITION-IN-PRINT"

SIGNAL'S May-June issue will be the enlarged pre-Convention number, devoted to the theme of the AFCEA Convention—Global Communications. It will contain the full program of the meeting and be distributed for use at the Convention. The outstanding feature of this issue will be the industrial "Exhibition-in-Print"—an exceptional presentation, advertising and editorial, of the products and services of companies in the industry.

The Hoover Commission Studies Government Procurement

(*Continued from page* 12)

9. The ASPR cost principles were never meant to apply to fixed-price contracts. There should be some penalty (to quote Gilbert & Sullivan "something lingering like boiling in oil") for any Government auditor who refers to them except in their proper place on cost-plus-fixed-fee contracts.
10. Although it might be difficult to use a common manufacturing drawing standard for battleships and radio sets, it would certainly help if each Technical Service and Bureau would not insist on their own format.
11. Let's quit kidding ourselves about schedules and stop asking for or promising unrealistic deliveries. Forced draft may be necessary in an emergency but it is very expensive and in many cases can be avoided if the contracting officer and contractor are honest with each other to start with.
12. Granted, the Government should know what spares it's buying, but if concurrent shipment of equipment and spares is essential, then the contractor's selection in the early stages is practically a must. Further, there should be a uniform policy on spares, at least for electronics, for the three departments and all the Technical Services.
13. If a company has spent its own money on developing and producing a particular gadget and if the Government wants someone else to make that gadget, compensation should be provided. It would be better, if a second source is needed, to have the owner of the design develop such sources for the Government.
14. There are the ASPRS, Departmental Procedures. Technical Services Instructions, etc., many of which carry a different interpretation of a regulation or a law. It would certainly save time and money in negotiating and administering a contract if these were integrated and a common document used.
15. There is the Fair Labor Standards Act, the Walsh-Healey Act, the Davis-Bacon Act, all containing different provisions on how you should pay employees under certain conditions. It is difficult for a contractor to determine which particular law applies to him and it would save time and money if Congress would put the package together with one set of provisions.
16. We have the Renegotiation Act and the profit limitation features of the Vinson-Trammell Act and the Merchant Marine Act. Either outright repeal or at least a common approach to the subject would make Industry feel much better.

You will see from the above that Industry feels pretty strongly about some of these roadblocks in the way of efficient Government purchasing and has taken the opportunity offered by the Hoover Commission to express their views. We hope that Congress and the Executive Branch can be persuaded to do something constructive about some of these matters.

In closing, I would like to take this opportunity to thank the members of the Electronics Industry who returned their questionnaires and gave us the benefit of a great many worth-while comments, and at the same time I would like to thank the Commission for the opportunity to give you this brief and very preliminary report.

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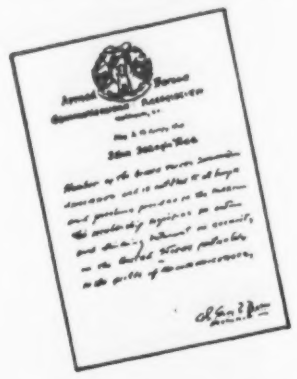

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GUIDE WORDS FOR TODAY

"STOP THE MARCH OF CONQUEST!"

says the Honorable

William F. Knowland

U. S. Senator from California

"Communist talk of coexistence," says Senator Knowland, "is designed to lull the free world to sleep until Russia's nuclear war potential equals that of the U. S. This will happen some time between 1957 and 1960. The Communists will then resume their march of conquest. They will nibble away at the free world, which will be too frightened to resist. Finally the U. S. will become an isolated patch of democracy — a continental Dienbienphu in a Communist totalitarian world."

* * *

Communist purpose has never deviated. Only Communist tactics change. When time is needed to recover from a loss or to prepare new moves, they ask for a "truce," or they talk "coöperation," or they ask for "coexistence." Communism tries to "lull the free world to sleep." We must guard ourselves against these things if our freedom is to survive.

W. B. Stuart PRESIDENT

DUTY HONOR COUNTRY
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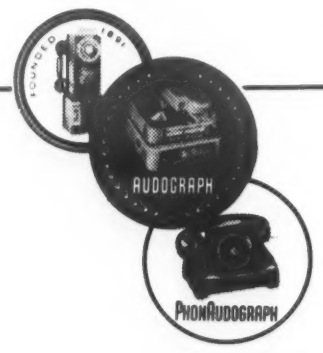

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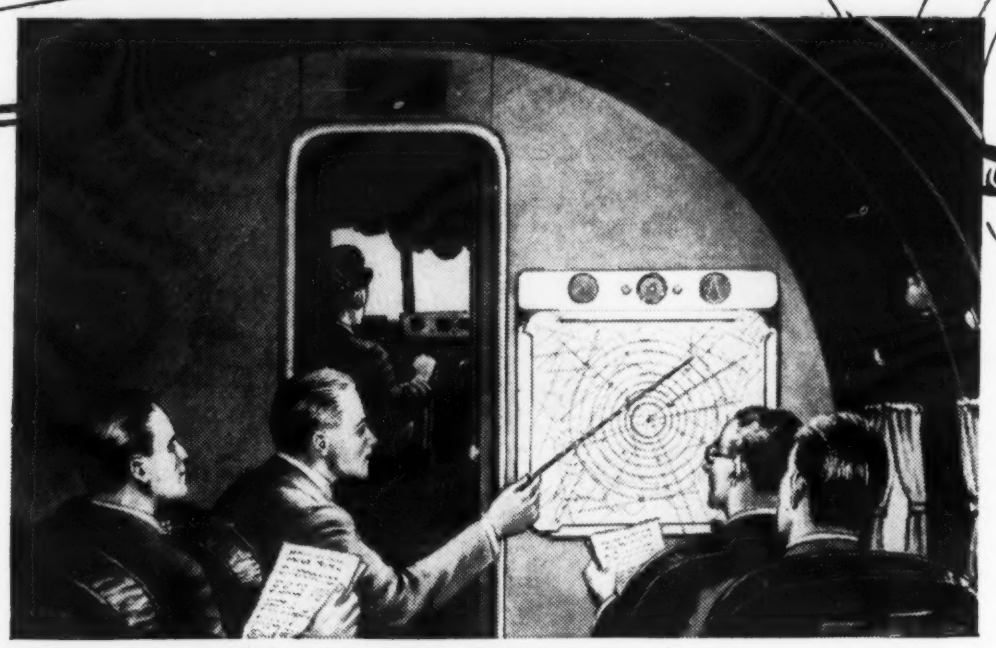

The interior of the "Flying Laboratory" of Federal Telecommunication Laboratories, a division of IT&T, is a veritable airborne workshop. Here, navigation aids for use at short and very long distances as well as for low approach and landing, and many other experimental radio and electronic devices are put through their paces under "in-service" conditions.

Perhaps most widely-known at this time of all aircraft navigation aids pioneered by IT&T scientists is ILS (Instrument Low Approach System). Radio beams of ground transmitters activate two needle pointers on the plane's indicator. When both are perfectly centered, the pilot knows he is directly in the center of the approach lane, and at the right angle of descent for a perfect landing.

Since the early days of flight, IT&T research has made many contributions to safer, more dependable flying. It began with the world's first instantaneous direction finder. It continued through ILS, air-to-ground radio, VHF airport direction finders, and greatly improved VHF omnidirectional radio range (VOR). Today, Navarho, Navascreen, two-color radar and Moving Target Indicator Radar promise great benefits for aircraft traffic control. And very important is IT&T's newest crystal-controlled distance measuring equipment (DME) which, in combination with VOR, tells the pilot with uncanny accuracy his distance and direction to or from a known ground station.

Years of experience in research, and high skill in production are important reasons why better performance is built into products for home, business and industry by the manufacturing divisions of IT&T—a great American trademark.

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